What's in this issue—

G. J. Stegemerten

If wage incentives are to be set properly and if accurate costs are to be secured, evaluation of labor necessary on each job is essential. **Westinghouse has developed time study methods that have licked the problem.** G. J. Stegemerten tells you on page 503 all about the Westinghouse technique. You can't afford to miss this one.

International Harvester has spent over a million dollars on its Chicago tractor works, much of it for special machinery. **Methods of machining, heat-treatment and inspection are the last word. A lot of special tooling is involved.** The vital facts about the new set-up, together with informative pictures, are presented on page 493 by our western editor.

You've heard about plants having an "open house." Well, Dad's factory had one last week. He tells you about the beneficial effects on page 509. He's in favor of more of 'em.

Some contract shops "just grow." There is neither rhyme nor reason to their layout. On page 512, however, is **a description of a shop which was planned from the ground up.** You will get some helpful ideas from it, especially if you happen to be a contract shop operator.

Chrysler uses many special jigs and fixtures in machining transmission cases, shifter mechanism units and other transmission parts at Kokomo, Ind. The story of how the work is done is on page 510, mostly in pictures.

Railroad men know that Norfolk & Western has one of the best shops in the country at Roanoke. They may not know that **milling is being used economically on a number of jobs there.** One of our editors who visited Roanoke recently brought back the dope on milling and offers it to you on page 498. There are good pictures too.

What happens when you machine malleable iron? An automobile company used it for pulley hubs, secured higher cutting speeds and longer tool life. Details are on page 502.

A small shop problem—to make thousands of deep conical shells at low cost on limited shop equipment. That taxed the ingenuity of the die designer. On page 500 is a practical account, with ample illustrations, of how the job was done.

For those interested in time study **—a new series of time-data reference sheets** starts in this issue on page 506.

Is it wise to hang up on a bulletin board in the shop examples of defective workmanship by the men? Al thinks it is a great idea and helps to reduce wastage. Ed thinks Al is pretty dumb in doing it. The pros and cons are on page 513.

Whether apprentice training is successful usually depends on how it is done. **E. W. Bliss Co. has an apprentice school operated under an honor system.** It gets results. The school's program is described on page 496.

Practical and simple ways of doing things in the shop are described regularly in *American Machinist.* This time the jobs and drawings to illustrate them are on page 514.

COMING

Once a year we publish a Modern Plant Number. This year it is to be devoted to the manufacturing operations of the Chevrolet Motor Division of General Motors and is to appear on June 29. Our editors have spent months roaming from Buffalo to Flint to Detroit to Muncie and to way points gathering all the data and securing hundreds of photographs. An outstanding feature will be the first printed description of Chevrolet's new Tonawanda plant for production of engines and rear axles. That plant is the most talked about plant in the country. Our editors will give you the "low-down" on manufacturing activities there. Apart from the production side of the story, we shall give all the details of Chevrolet's program, including how a Chevrolet car is born. We are not too modest to add that the Chevrolet Number will not only be the best looking issue that we have ever published, but also will rival in fine appearance any issue of any business paper ever printed. That's a pretty big claim, but we stand by it.

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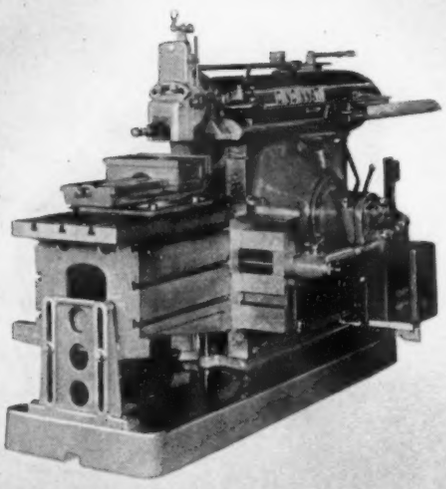

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AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Ripples on the Tide

NOW THAT THE ECONOMIC tide has rushed out once more and left most of us poor fish high and dry, we are prone to believe that it will never come in again. Talk to the average man in business or industry today and he is almost sure to tell you that he can see no reason to expect any improvement for a long time.

He will also tell you that business is worse than it was in 1932, and that he has not the reserves now that he had then because New Deal taxes have taken them away from him. He is looking for somebody to vote against, just as he was then, and he will find him.

There is no point in trying to minimize our present troubles—they are real enough and heavy enough in all conscience. But let's not forget that the tide always comes in again. King Canute's demonstration of the futility of trying to stop the marine tide was so effective that no one has had to repeat the experiment made nearly nine hundred years ago.

Other kings and other potentates in more recent times have missed the point of Canute's lesson and have made equally futile efforts to stem the economic tide. They might as well skip stones on a beach wave. They can produce ripples on the wave, or maybe a splash, but the wave itself, and the tide behind it, comes relentlessly on, or goes as relentlessly back. So with the economic tide. We can make ripples by taxing capital, by cutting wages too much, by holding them too high, by sterilizing gold, by desterilizing it, but sooner or later the ripples die away and the tide of depression or recovery proceeds.

If we could only step back far enough to lose sight of the ripples we should see the major movements more clearly. Some few have that gift and are even now quietly getting ready for the return of the tide that is sure to come. They are not saying very much about it, because they do not want to be ridiculed for differing from the majority of their fellows, and because they expect to get the jump on their competitors who can see nothing but the ripples.

THE POLITICIANS in power are going to do a lot of splashing to keep in power, and the politicians on the outside will do what splashing they can to get in again and push the other fellow out. But all their splashing will only stir up the water. The main economic tide will come in again. It may not be a full moon tide this time, and it may go out again before it comes in far enough to satisfy all of us, but come in it will, and he who is ready to ride it when it comes will profit thereby.

Gaging Business

MANUFACTURERS in the metal-working industries have settled down to a slow production pace which is likely to last during most of the summer. Though hopeful of an upswing in the early fall, equipment buyers are inclined to withhold the placing of orders until they have tangible evidence of an improvement ahead. Machinery orders in May dropped to 66.7, compared with 90.3 in April, according to the index of the National Machine Tool Builders' Association. Close to half of the machinery business continues to be for export.

Steel operations are dragging along at 27.1% with a poor June and July in prospect. Auto makers intend to continue restricted assemblies of current models well into July. Farm implement output is slackening after a satisfactory season. With huge foreign orders at hand, airplane factories are the busiest spots in the country. Railroads are buying very little rolling stock. Shipbuilding, already more active than most industries, is preparing for expanded schedules as navy and merchant marine construction programs get under way. Business Week's index of business activity is at 59.6, as against 58.2 a month ago.

CHICAGO—Farm implement and tractor sales have been well sustained, but output has dropped seasonally. Demand for wire goods has helped steel mills, though the district rate is below the national rate. Tin plate output is at 45%, with big crops indicating a heavy canning season ahead. Woodworking machinery orders are sharply off because of a decline of 44% in furniture production this year. Machinery inquiries are better.

ST. LOUIS—Equipment buying is being held back until the business trend becomes clearer. Reports from the Sioux City-Council Bluffs-Des Moines area indicate that farmers have money and are spending it. Shutdown of crude oil production in the southwest has curtailed demand for drilling machinery. However, business in Texas and Oklahoma is better than in most places.

DETROIT—The equipment market is dull. There is a little more activity, however, in small tools. Tool and die shops are moderately busy, but the volume is far below last year's. Toledo auto parts plants are working small forces on short shifts.

NEW ENGLAND—Merchant ship construction is picking up, and Navy yards and arsenals are planning expansion of production facilities when funds are released by Washington. One private shipyard expects to double its list of employees within a year. Woolen textiles show some improvement. Inventories are shrinking steadily in many lines. Machinery orders are at low ebb.

PITTSBURGH — Steel operations cling to a level of about 25% with no improvement in sight. No support appears likely from automotive companies until August. Railroad steel buying is negligible. Government-financed projects should help order books later this summer. Machinery sales and inquiries are slack. Westinghouse is proceeding with its $12,000,000 plant expansion and modernization program.

CINCINNATI—Machinery bookings are still dwindling, with export orders as well as domestic sales off sharply. Inquiries are scarce, with no upswing anticipated until early fall. A few machine tool plants are working full-time on foreign orders, but otherwise short schedules prevail.

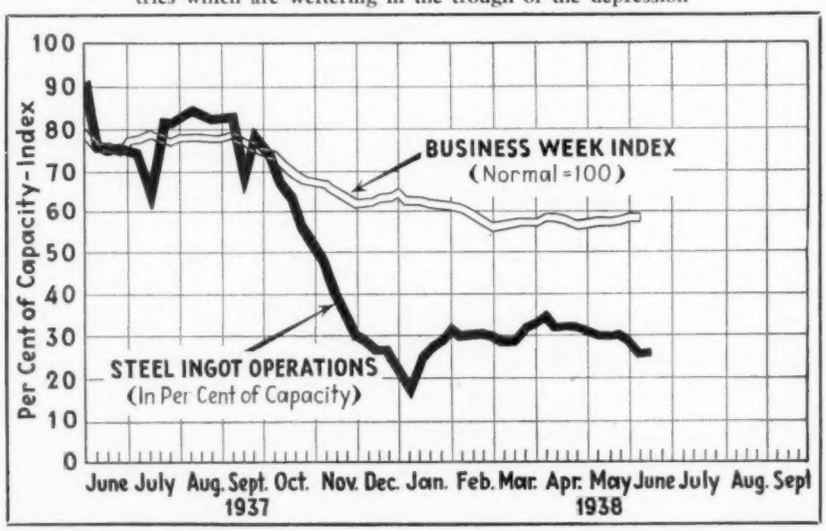
CLEVELAND—May's volume of equipment orders was below April's, and June is running behind May. Inquiries, particularly those from abroad, have slowed down. Auto parts production is almost at a standstill as the car model year ends.

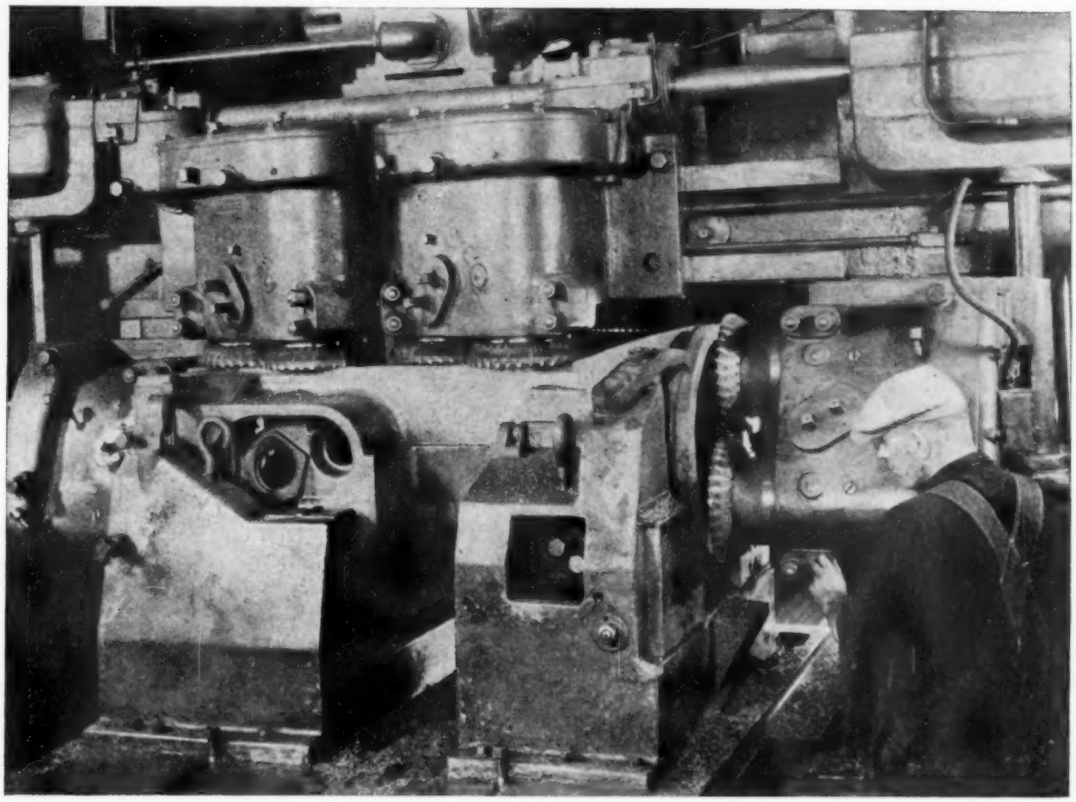
SAN FRANCISCO—No significant change in industrial activities is noted. Operations in airplane factories continue to climb. Building is showing moderate increases stimulated by FHA, the volume approximating that of a year ago. Despite a sharp decline, oil production exceeds demand and is above the quota set in California by voluntary curtailment. Farm income is down about 20% from last year's extra high level.

NEW YORK—A few equipment orders have been placed by aircraft companies either to tool up for specific jobs or to round out production facilities for manufacture of planes for foreign buyers. Otherwise prospective machinery purchasers are twiddling their thumbs.

STEEL VS. GENERAL BUSINESS

Steel maintains a low level of output, reflecting conditions in automobile manufacturing and the heavy industries which are weltering in the trough of the depression





A battery of these special milling machines does only the job of milling tractor main frames; they pay their way because their precision insures a minimum of assembly trouble. The machine shown here mills the top and two ends of the main frame

Tractors Take Special Tooling

International Harvester's Chicago plant incorporates many modern methods for machining, heat-treatment and inspection

INTERNATIONAL Harvester has recently spent more than $1,000,000 on an addition to its Chicago Tractor Works, much of it on special machinery. The majority of operations on the T-20 TracTracTor rear main frame, for example, are performed on special equipment. To insure proper relation of all surfaces, as many operations as possible are done simultaneously on all sides of the part.

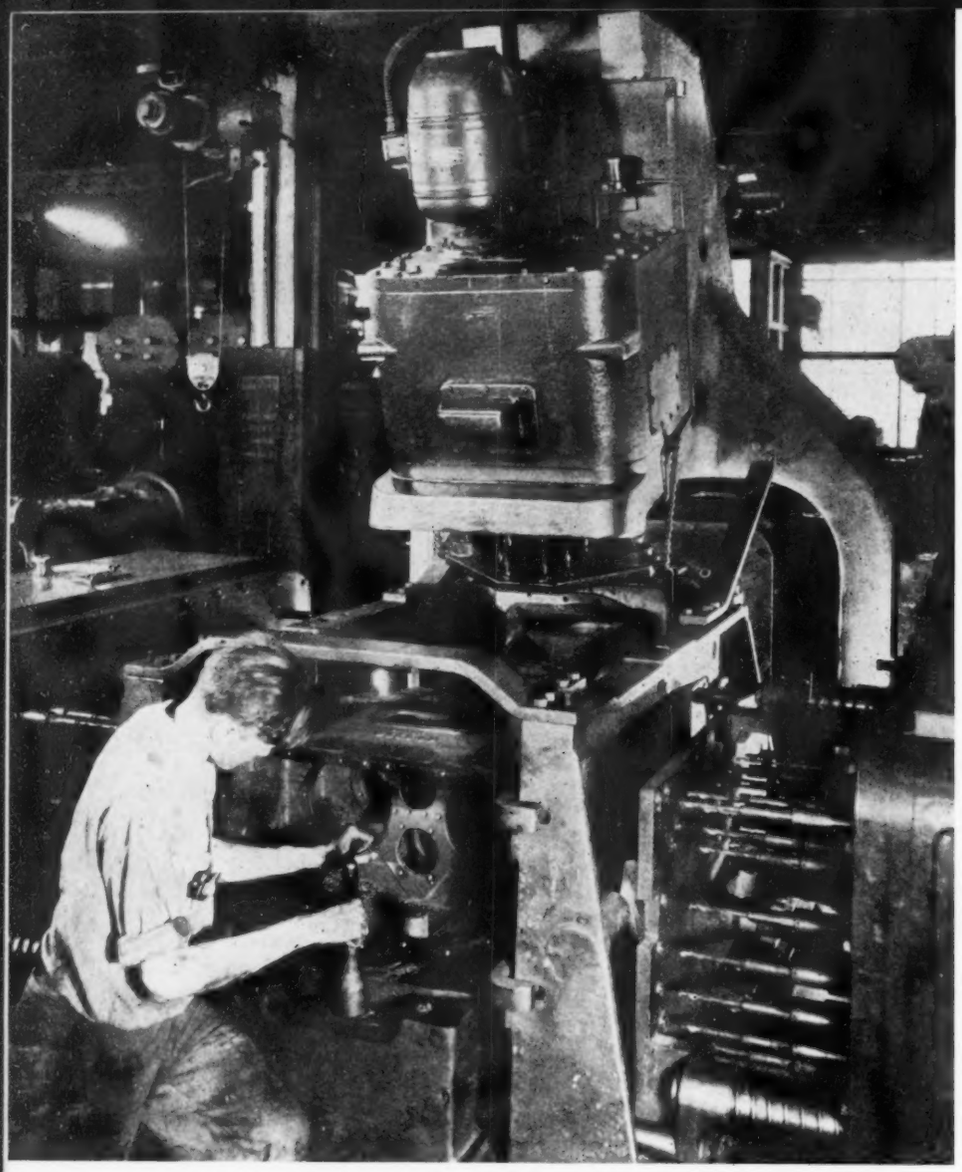
The first operation on the casting is performed in a special multi-spindle milling machine which was designed for the sole purpose of machining this part. This machine rough and finish mills the top and both ends, using a total of ten milling cutters. The seven roughing cutters are 15 in. in diameter, and have Stellite inserted blades, while the three finishing cutters are 26 in. in diameter, and have high-speed steel inserted blades. Table feed is at the rate of 9 in. per min.

The second milling machine, similar to the first, mills the bottom of the casting, roughs the two side surfaces with interlocking 12 in. diameter Stellite inserted-blade cutters, and finishes both sides with 30 in. diameter high-speed steel inserted-blade cutters. Table feed is 9 in. a min.

The next operation is face or profile milling an inner wall in a four-way machine. The machine is so controlled that a predetermined path can be traced by the milling cutter spindle. The profile cutter is guided in its course by means of a grooved templet and tracer point. As the tracer point follows in the groove, electrical contacts are made which cause the milling cutter spindle to move either up or down, dupliating the exact course of the tracer point.

After the milling operation is complete, frames are handled by the use of bridge cranes or electric hoists, and are placed in a special four-way boring machine. Here the bearing seat and gear shaft centers are first roughed, and then finished bored to the limits required for gear centers.

One hundred and seventeen holes in the rear, top and bottom surfaces are drilled and tapped on special three-way machines. There are 60



Multiple operations to eliminate resetting as practised at International Harvester is again demonstrated in this tool which drills 122 holes simultaneously in four faces of the main tractor frame

holes in the rear, 40 on top, and 17 in the bottom, ranging from $\frac{5}{8}$ to $1\frac{3}{4}$ in. diameter.

The drilling and tapping of the two sides, front and inclined top section are performed on a four-way machine. A total of 122 holes are drilled, of which 12 are in the inclined top, 46 in each of the two sides, and 18 in the front end.

In finishing the remaining miscellaneous holes large roll-over fixtures are used which make it possible to rotate the part in any desired plane. In this way all sides of the frame can be worked on without resetting.

After the part is machined, it is given a thorough washing. The machine designed to do this is lined with nozzles—top, bottom, sides and ends. The machine enables the user to inclose the part within spray nozzles, yet roll the part in one end of the machine and out the other.

The mechanically operated vertical sliding doors at each end work in unison. A series of short rollers along each side enable the operator to advance the piece into position without obstructing the sprays washing out the bottom. The side, top and bottom nozzles are fixed in position. As the door at each end is closed, nozzles swing horizontally into position directly in line with the doors, thus completely inclosing the frame.

The cleaning solution is forced through the spray nozzles under a pressure of 60 lb. per sq. in., resulting in an excellent job of washing.

The thoroughly cleaned frame,

The crankcase for each five-bearing diesel is line reamed with bearing caps in place; each cutter has sixteen teeth

Rigid inspection methods control all production; one of every ten men in the plant acts as inspector to insure quality. After Tocco hardening, crankshafts are given a careful Magnaflux inspection

after being given a rigid inspection, which includes many special gages to check all bore alignments, is ready for assembly.

Machining the crankshaft is done in another department. The material for the F-12 crankshaft is a medium carbon steel containing some chromium.

After forging the crank in a 12,000-lb. hammer, the flange end is formed in a 4-in. upsetter. It is then normalized, hardened and drawn to a hardness reading of 28—32 Rockwell C. The cranks are then straightened and pickled, and are ready for machining.

The shaft is centered in a double-end machine after which the driving and locating spots are straddle milled in the web or cheek of the two outer crankpins.

The crankshaft is now ready for the turning operations. By means of a monorail air hoist, it is placed between centers of an automatic machine and located lengthwise from the center bearing. The crankshaft is positioned radially by the two locating spots on the webs and clamped with two adjustable caps. All line bearings are turned simultaneously, holding all to within 0.010 in.

The electrically controlled mechanical feed moves the tools to and from the work at any desired rate and provides a dwell or sizing period at the end of the cut. The tool dwell is desirable in removing the chatter marks and any eccentricity caused while the tools feed into the work.

The plain and special high-speed steel form tools used in this operation are carried on heavy tool bars. The cuts of the front and rear tools are balanced at a ratio of 60 per cent to 40 per cent, holding the shaft on definite centers as they feed toward each other, facing the web and forming the pin diameter.

The outside line bearings are rough ground next for properly locating the crankshaft in the automatic pin-turning lathes. After turning the inside pins on one machine and the outside pins on another, the front, rear and center bearings and crankpins are rough ground.

Drilling the $\frac{1}{4}$-in. diameter and $4\frac{1}{2}$-in deep oil holes, which are used to pressure lubricate the crankpins and main bearings, is done on an automatic hydraulic feed step drill.

All sharp edges are removed, and special care is given to counter sinking and stoning the oil holes before beginning the Tocco hardening process. In addition to this, short tapered wooden plugs are driven into the oil holes and peened over to fill in the countersinks.

In hardening a crankshaft by the Tocco method, the operator places a crankshaft in a specially designed fixture, clamps a pair of copper inductor blocks around the bearing surfaces which are to be hardened and pushes a button. This equipment is so accurately synchronized that twelve seconds later, when a signal light flashes, he removes the shaft which now has file hard surfaces with a reading of 57 to 63 Rockwell C. The ends of the crankpins and main bearings including the fillets are not hardened because otherwise there would be a tendency for cracks to develop.

Two fixtures are necessary for the Tocco hardening of the small crankshaft, one for the line bearings and the other for the crankpins. After hardening, the shaft is drawn at a low temperature, and given a Magnaflux inspection.

In spite of the fact that certain parts of the crankshaft have been exposed to extremely high temperatures, it is not necessary to straighten before finish machining and grinding for which only about 0.015 in. of material has been left.

After drilling, reaming and tapping the holes for the starting crankpin, the crankpin end of the shaft is sawed off and recentered.

The flange end is now rough ground in a plain grinder; and the pins are semi-finished in the latest type hydraulic pin grinder, using a hydraulic straight in-feed mechanism. The 30-in. diameter wheel is fed in rapidly until it is about to come in contact with the work. It then slows down automatically to the predetermined grinding feed and continues to feed in at the slower speed until the base comes against a positive stop. Reversal of the control causes the base to feed rapidly back to its starting point.

Next the inner flange face is machined, and the oil groove is put in, after which the flange holes are drilled, and the necessary holes reamed and tapped.

After finish grinding the bearings and pins, the crankshaft is placed in a special machine which laps or polishes all bearings and pins automatically in one setting. Following the lapping operation the thread on the crankpin end is milled, after which all touch-up operations, such as stoning, filing and polishing are done.

Two keyways are milled in a hand mill; then the final operation, balancing, is done in a compensator type dynamic balancing machine. This machine is electrically operated. The crank is placed on the rolls and rotated on the two outer bearings. First one end is balanced and then the other. Any out of balance causes a sparking on a dial indicator, which revolves at the same speed as the crankshaft, about 320 r.p.m. By pressing a button a given weight is moved into position to offset the out of balance condition. When the weight is in the correct position this sparking on the indicator ceases. The amount of unbalance is read in hundredths of an ounce, and the position of unbalance indicated.

Tocco furnaces are used in the new building devoted entirely to induction hardening. Bearings have a hardness of approximately 60 Rockwell C after a 12-sec. operation

Apprenticeship Under the Honor System

Experience of the E. W. Bliss Company demonstrates that intelligent effort on the management's part cannot fail to generate enthusiasm of apprentices

FRED H. COLVIN
Editor Emeritus, American Machinist

RECOLLECTIONS of some of the old-time apprenticeship methods make the apprentice school of the E. W. Bliss Company especially interesting. The simplicity of the plan, the management's interest in the boys, and their keen interest in the work are noteworthy.

There is no formal indenture. The management feels that a dissatisfied apprentice should terminate his service at any time he desires. Likewise the company wishes to be free to release an apprentice who cannot, or will not, measure up to the expected standard.

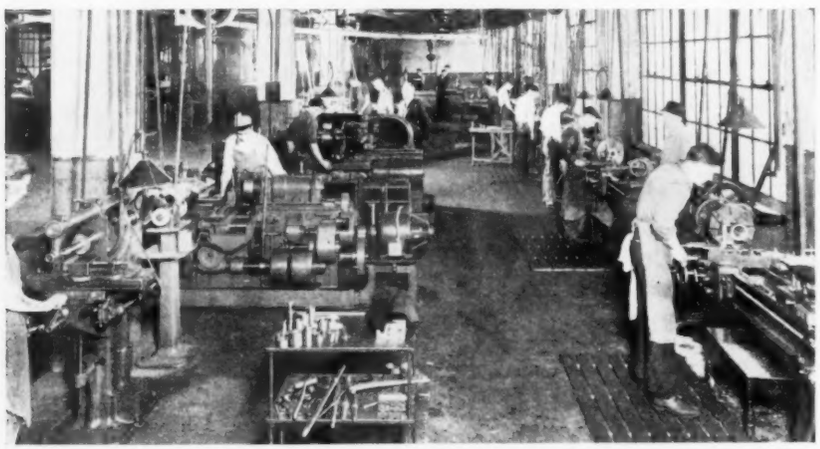
Apprentices must be between 18 and 21 and have high school education. Age, physique, education and family background also play a part in selecting candidates. Sons of employees are given preference, other facts being equal. The course begins with a few months in the school shop, which in some ways may be likened to the vestibule shops of war days.

The usual apprenticeship course is four years, in eight terms of six months. Those showing special aptitude for drafting can serve one or more years beyond the regular term, and are graduated as draftsmen. Selection of this course is optional. All apprentices have extra instruction in drawing and in shop mathematics, for 1½ hrs., two evenings a week. The school begins ½ hr. after the shop closes, giving time for a "snack" at the cafeteria.

After the usual preliminaries of joining the class, a new boy is introduced to each of the boys in the class shop room. This practice contributes to the spirit of helpfulness that has replaced the old idea of "hazing" by sending a new boy after a "left-handed wrench" or "red signal oil." The first week is spent in watching the work being done. Then the boy is put on the first machine that is available for the simple jobs given to the beginner. All the work comes from regular shop product—there are no "practice" pieces.

An instructor stays with the new boy until he can handle the job given him, which may take two or three days. This instructor may be one of the advanced boys who is capable of instructing others. One of the advanced boys is made foreman of the school shop for three months, giving way to another boy at the end of his term. As the boy learns he is transferred to other machines in the school shop, until in five or six months he is ready to go down in the shop on production work under a regular foreman. The quality of the training can be judged by the demand for boys from the school by the shop foreman.

In the office of the apprentice supervisor, whose personality has much to do with the success of this school, are wall charts that give a complete history of each student. These show by suitable markers the location of each of the 80-odd apprentice boys in the shop. In addition, the charts show each boy's progress from department to department, and the quality of his work in each. This system checks the boy at all times and prevents his being held too long in one place. Another chart shows when an increase in pay is due. Notice of the advance goes to the accounting department a week ahead, so that



Boys get acquainted with machine tools while spending several months in the school shop, and then enter the production shop under the foreman

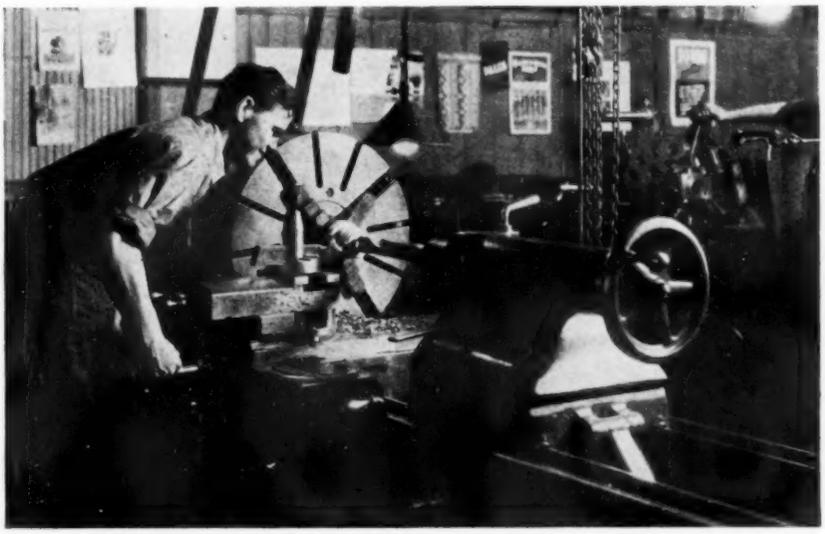
there will be no delay. When the increase is made, it is checked on the chart and the date of the next raise, six months hence, is marked.

Classes are held two evenings a week in shop mathematics and in drawing. These are under the supervision of Chief Engineer I. Patrick and his assistants, who have worked out many problems having practical application to the work done in the shop. Drawing is taught to enable correct reading of blueprints by the boys rather than to make them draftsmen. Models and blueprints in isometric perspective are used in this work. Perspective prevents direct copying of a projection blueprint, and makes the boy familiar with the difference in appearance between the object as shown in perspective and the usual projection drawings.

Perhaps the outstanding feature of the Bliss apprentice system is the Honor Council, consisting of seven boys elected by the whole school. This council settles differences of opinion and grievances regarding personnel matters. It determines necessary discipline, metes out punishment when necessary, and has recommended discharge in one case. No foreman may discharge an apprentice, though he can request his transfer to another department. Such requests are unusual, and there are more cases where the foreman asks that the boy remain in his department longer than scheduled.

School hours, especially when they come at the end of a work day, are seldom very popular. This school is an exception, for which there seems to be only one reason—personality of the instructors. They, through an enthusiastic interest in the boys, have developed lessons and explanations of principles that are of genuine interest. Thus, instead of watching the slowly moving clock hand, the apprentices are likely to delay departure as long as possible. This was true of a recent examination. The boys asked for more time to solve their problems. Some of them stuck long after usual hours, determined to solve the questions no matter how long it took. The result was an astonishingly high average mark for the whole class. Another feature, which is a sensible innovation, is permission to use note books in solving examination problems. Few engineers attempt to remember all the formulas they use; they consult handbooks. The main thing is to know how to apply formulas. That is what these boys do at examination.

Practical problems in drawing and shop mathematics worked out by the engineering department do not fail to maintain interest in the two evening classes per week

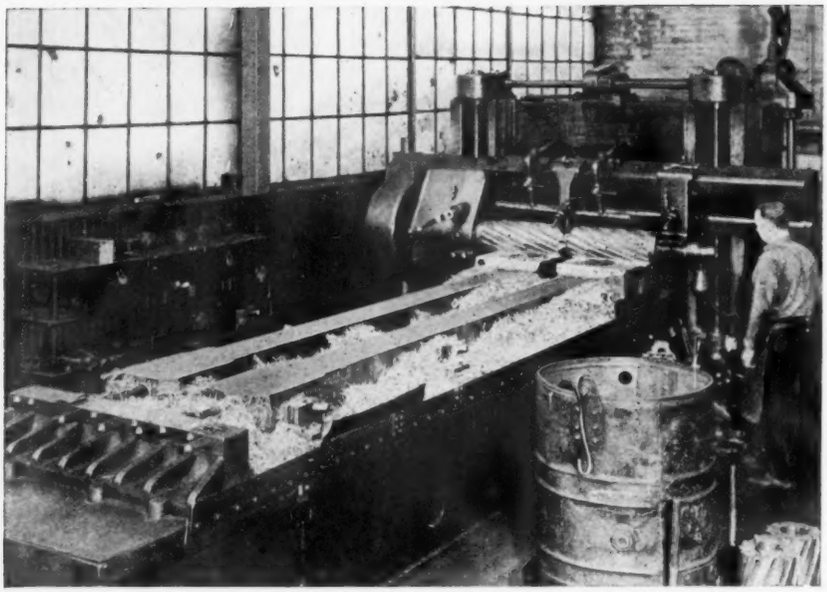


The Bliss school plan treats each boy as an individual

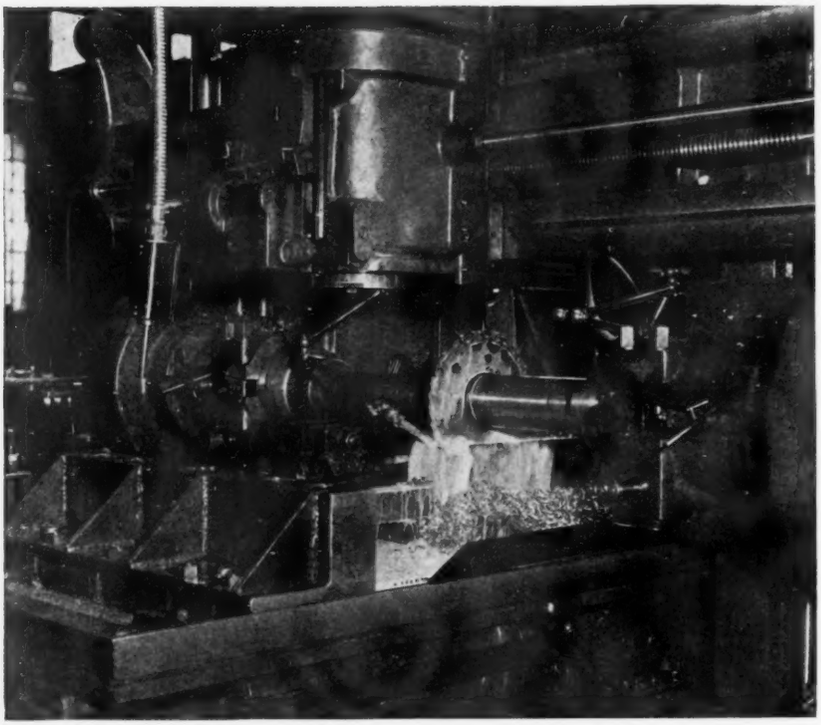
Back of the success of this apprenticeship system is the personnel of the entire management. Apprentice Supervior Frank Schmidt exudes enthusiasm for his boys and for the cooperation of his superiors. Factory Manager, Thomas H. Blair, seemingly the godfather of the plan, is genuinely interested in its success and in every apprentice in the shop. In Frank Schmidt and I. Patrick they have men who understand boys and how to gain their confidence and respect. These men realize that varying temperaments require different treatment for best results. The individual is considered as such and treated so as to bring out the best that is in him.

Lastly, but an important item, is the rate of compensation. As of Nov. 1, 1937 it begins at 35 cents an hour with a raise of four cents an hour every six months if progress is normal. This brings wages in the final six months up to 63 cents per hour, which is a revelation to those of us who remember apprentice's and journeyman's wages of earlier days. The changes in apprenticeship ideals and methods have been as great as that of the wage scale. With such apprenticeship methods in general use we should soon have an ample supply of good mechanics.

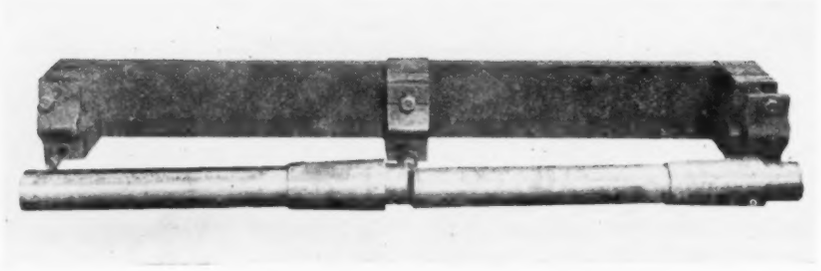
MILLING IN A RAILROAD SHOP



RAILROAD shops find many uses for the milling machine. This type of equipment was among the first of the modern machine tools to be adopted for railroad work, and because of its inherent suitability for the jobs required of it, has continued to be popular. Typical of this class of work are the operations illustrated here. They are from the Roanoke Shops of the Norfolk & Western Railroad.

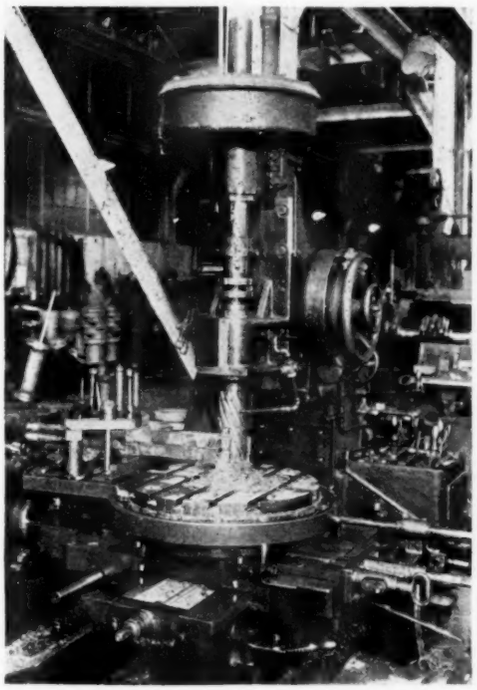


Connecting rods are slab milled, two at a time, in a set-up that taxes the capacity of the table. The size of cutters and quantity of chips indicate the healthy rate at which metal is being removed. Rugged fixtures are designed to hold the work securely and to withstand a heavy thrust

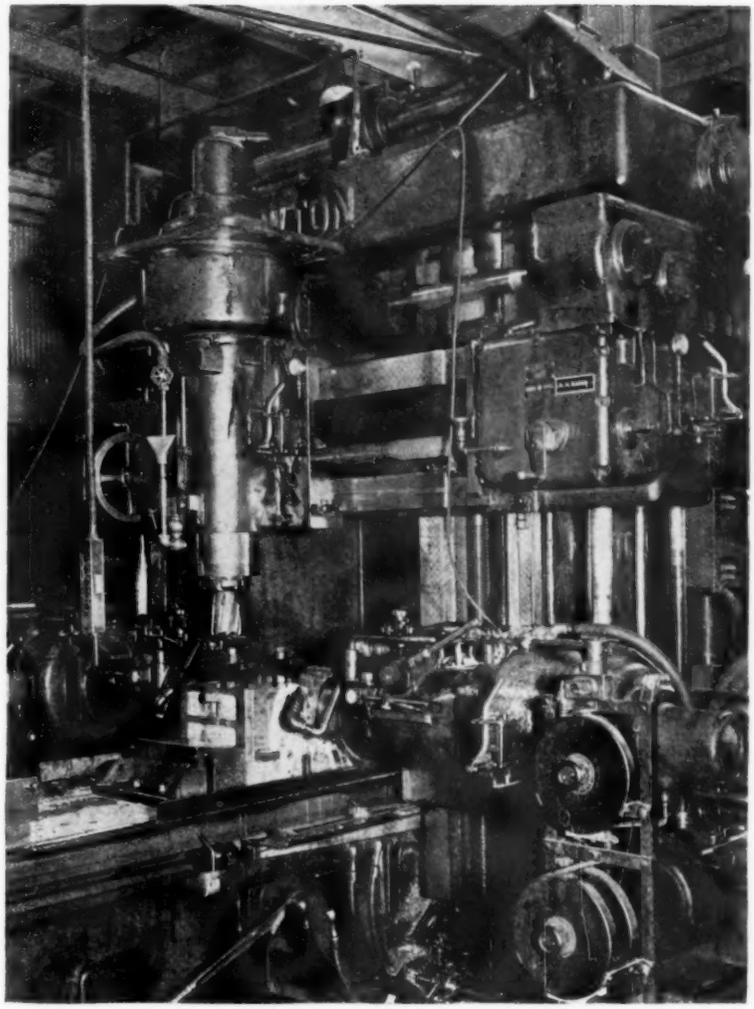


Another interesting milling job is cutting the slots that make the bearings in multiple surface crossheads used on the newer types of heavy-duty locomotives. Crossheads which are of steel alloy castings are first bored for the piston rods. They are milled in pairs and in tandem

Each crosshead is located on a sub- or dummy-rod in the piston rod hole; the rods may be seen clamped just ahead of the thrust block across the table. The block is made of heavy steel plate cut to shape and fabricated by welding

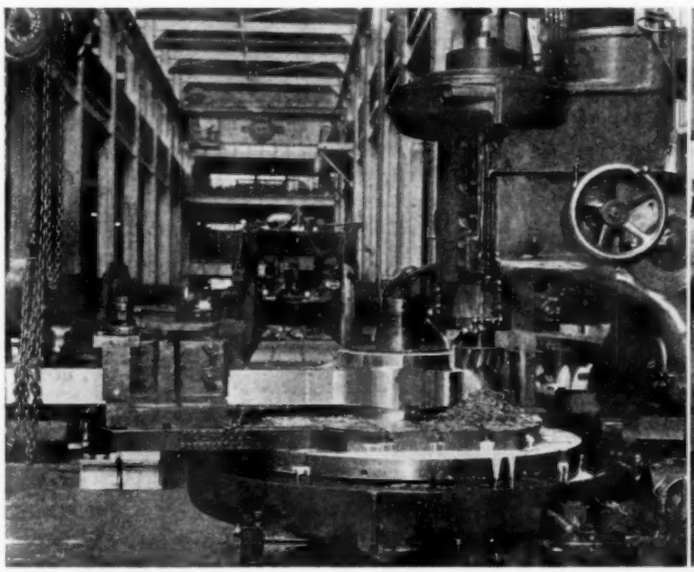


Buffer stems for passenger car use are machined on the rounded end in a vertical milling machine. An extension is provided at one side of the rotary table to support the ends of the stems which in this case are being milled two at a time

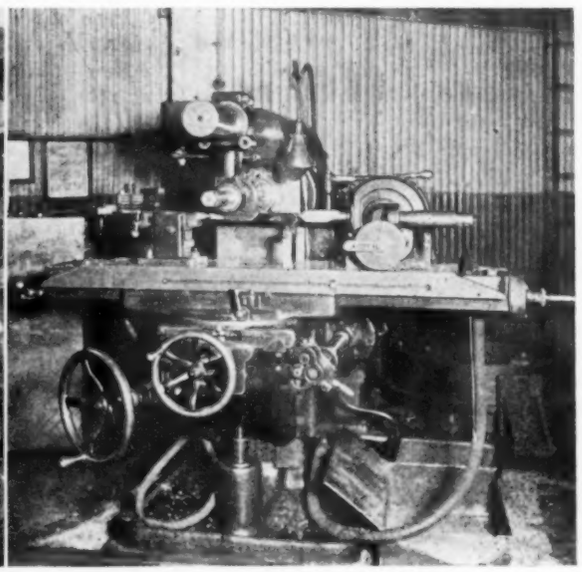


A multi-spindle milling machine set-up is used on a driving box for a roller bearing. Two heads machine the pedestal shoe surfaces and later cut circular oil grooves in them by means of a suitable tool

Rod ends are milled in a vertical machine set-up. Located by its bore, the rod extends beyond the rotary table with the outer end supported by chain hoist that hangs from a small jib crane mounted on the head of the machine itself



The job of milling the locking key for roller bearing driving boxes is done on a knee type toolroom machine. The extra long center provided in the dividing head, is slabbed off on the side to clear the two straddle cutters which machine both sides simultaneously



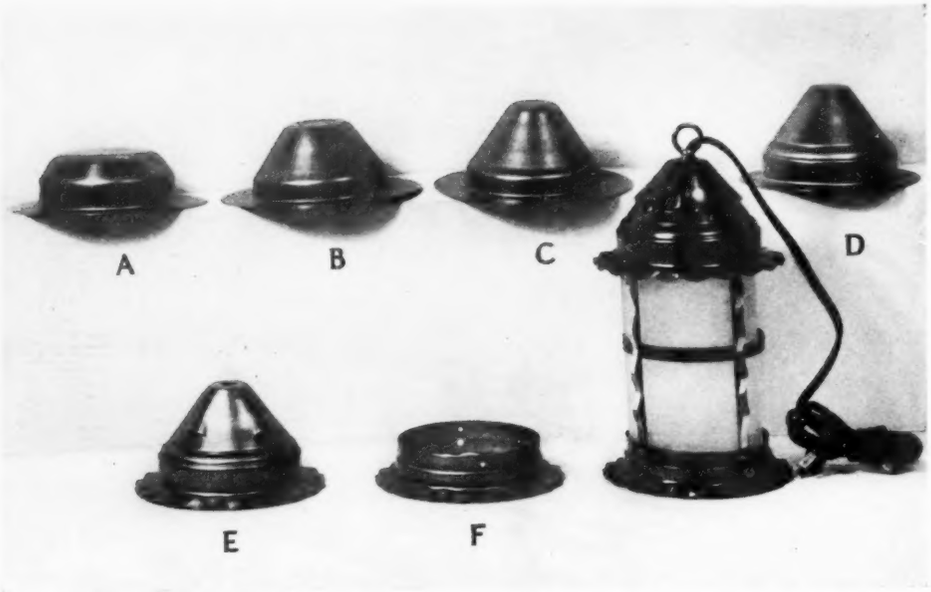


Fig. 1—Shell *E*, which forms the upper part of the ship's lantern, was made in tools that combined operations so far as possible

Die Problems in Novelty Manufacture

Ingenuity of the die designer is taxed to provide single tools that will make thousands of deep conical shells at low cost on limited shop equipment

MARK GOLDEN

ALL SORTS of jobs come to the die designer who works in the jewelry and novelty trades. A recent example is the inexpensive ship's lantern made primarily of the pieces *E* and *F* in Fig. 1, and a frosted pickle jar, the assembly being shown at the right.

Conical shell *E*, in addition to presenting the difficulties usually met in dies for work of this type, has a relatively small diameter at the apex. Four small holes in the body must be punched at the same time as the hole in the top in order to save production cost. Moreover, the four vent holes in the angular surface present another problem.

Although a rather large blank, $7\frac{3}{8}$ in. in diameter, was required for this shell, a combination die was chosen and worked very successfully. The face of the punch was relieved about 0.002 in. for about half its surface so that little pressure was exerted on the edge of the blank. The combination die was placed in a No. 21 Bliss press that had a combination plate in the bolster and pressure pins going through the plate. A rubber spring barrel 6 in. in diameter by 10 in. long was used. In this operation the shell was drawn to a diameter of $4\frac{1}{16}$ in. in the body and $1\frac{5}{8}$ in. deep.

Stretching the first-operation shell to a conical shape and bringing it to a height to $2\frac{1}{8}$ in. were accomplished on the second-operation die shown in Fig. 3. A depression was made at the apex of the part so that less strain would be put on the shell by succeeding operations. All parts of the die were made of cold-rolled steel, except for the die shoe which was cast iron. The pressure ring and the punch were pack hardened and polished.

In the third operation the shell was brought to a height of $2\frac{1}{2}$ in. while the flat surface at the apex was reduced to $1\frac{1}{16}$ in. in diameter. A die similar to that shown in Fig. 3 was used. For both the second and third operations a rubber spring barrel 3 in. in diameter by 7 in. long was found satisfactory.

In the fourth operation the trimming and finish forming of the shell is done as shown at *D*, Fig. 1. The die shoe, Fig. 4, is a heavy cast-iron plate while the cutting ring and pressure ring are tool steel,

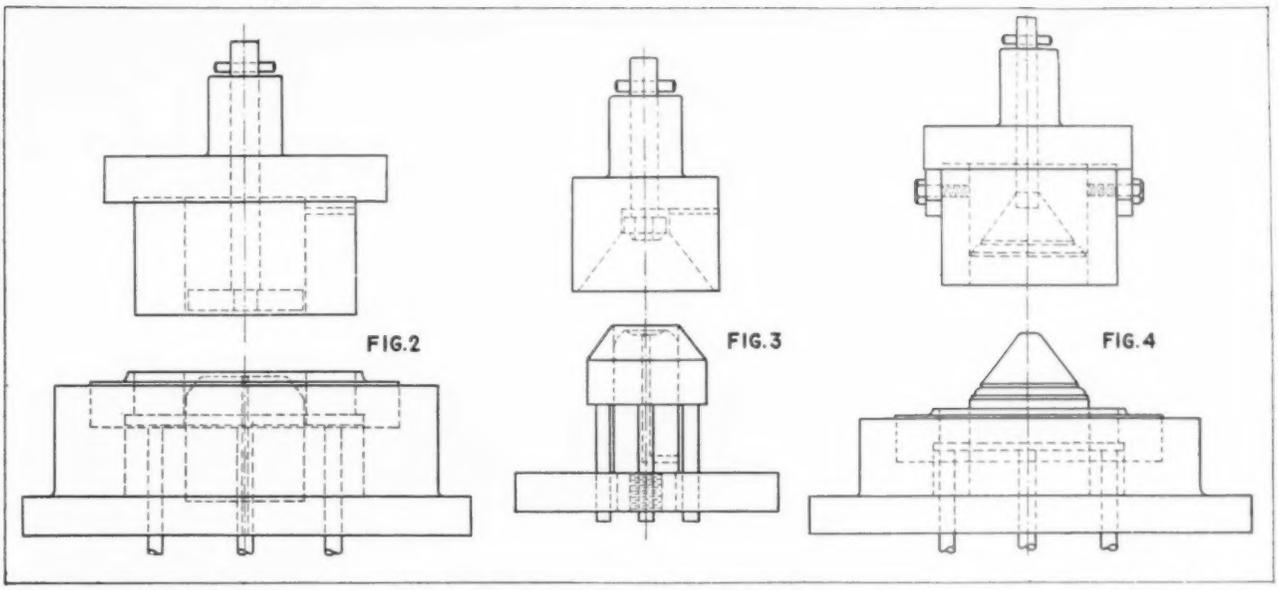


Fig. 2—A blank size of 7¼ in. is rather large for a combination die, but relieving the face of the punch was largely responsible for successful operation. Fig. 3—When stretching the shell to a conical shape, a depression was made at the apex to lessen the strain of succeeding operations. Fig. 4—Finish forming and trimming the shell are done with tools having hardened and ground, tool-steel cutting and pressure rings

hardened and ground. As in the first-operation die, the rod holding the rubber spring barrel was attached to the combination plate of the press, and pressure pins go through this plate. When finish formed the shell is 2¾ in. high measures 1 in. across the apex, and the cone-like portion has an included angle of 75 deg.

Four equally spaced holes, 0.130 in. in diameter, are punched in the cylindrical part of the shell in the next operation, and at the same time a 1 3/32-in. hole is punched at the apex. The horizontal punches, as shown in Fig. 5, are held in slides in the lower member by means of Allen setscrews. These punches operate in dies fastened in the center die block. This block also holds the die for making the center hole. Side punches are operated by tool steel cams on the upper member, these cams moving the slides 1 3/16 in. in order to clear the flange of the shell which is 1 1/16 in. wide. Slides return under spring pressure.

After crimping the flange on a simple die, the last operation is rather novel in that it involves doing a big job in a small foot press. The die shown in Fig. 6 makes the vent holes required in the shell. The punch is held in the rectangular steel bar while the locating block for the shell acts as a stripper. A spring pin in the locating block serves to locate the shell by the holes previously punched. The tool-steel die is fastened to the cast-iron punch holder and is kept in line by two ½-in. drill rod pins. The completed stamping is shown at *E*, Fig. 1. Incidentally, part *F*, Fig. 1, was perforated on the arc die shown in Fig. 5, and crimping the flange was performed on the same die as used for the conical shells' flange.

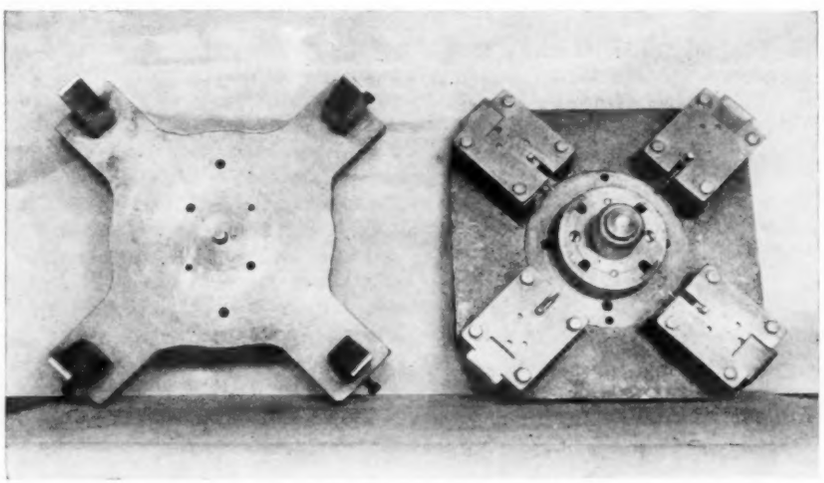


Fig. 6—Vent holes are pierced in the conical part of the shell, one at a time, by foot press tools having the punch in the lower member

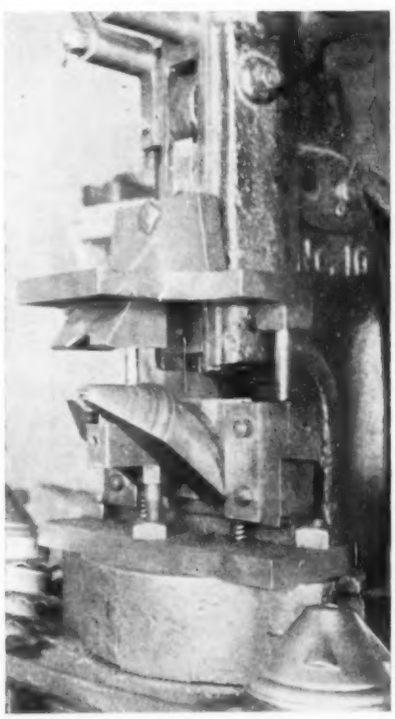


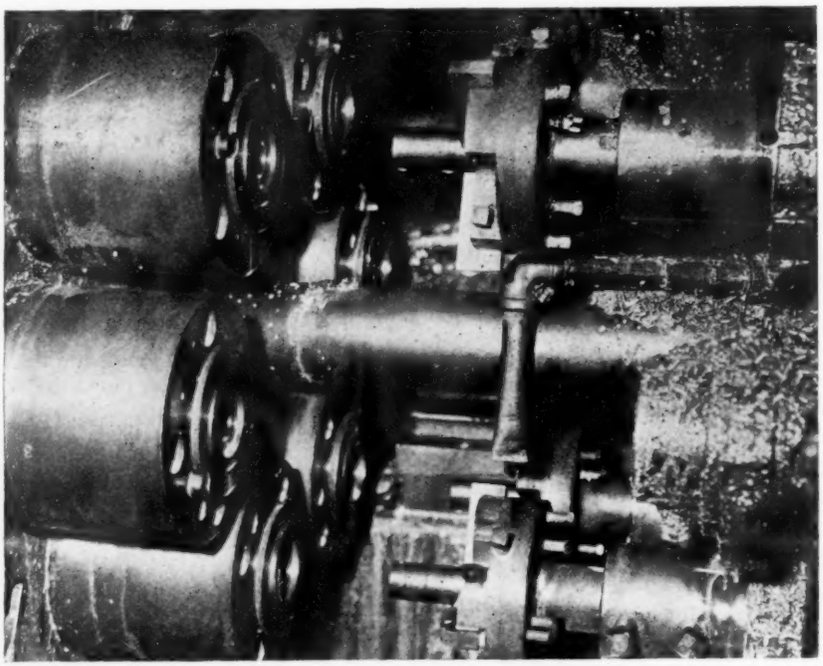
Fig. 5—Four holes are punched in the side wall of the shell by horizontal punches carried in spring actuated slides. Cams on the upper member operate the punches

Malleable More Machinable

Higher cutting speeds plus longer tool life result when malleable iron is used for automobile pulley hubs

NUMBER and kind of machining operations to be performed on a part often determine the selection of a material for that part. This is particularly true in the automotive industry and related fields. An example is found in the selection of malleable iron for the lower fan pulley hub of a prominent motor car.

Eight distinct machining operations are performed on the hub, namely, boring, turning, facing, drilling, tapping, polishing, broaching and hand reaming. The hub itself has a 2 3/16-in. diameter with a flange of 3¾-in. diameter and a hub hole which is 1 15/32-in. In the production of this item at one plant, a New Britain automatic chucking machine is used for the boring, turning and facing operations. Tools are Stellite tipped. Using a surface speed of about 135 ft. per min., a feed of 0.050 in., depth of cut 3/64 in., 125 pieces per hour are produced. Tool life averages 1,000 pieces per tool grind. Outside diameters are machined to a tolerance of 0.007 in.



Flange faces are roughed and finished on a six-spindle chucking machine using Stellite tools

The next step in production involves the roughing, semi-finishing, and finishing of the flange backs. For this operation a New Britain automatic chucking machine also is used with three working spindles. Stellite tipped tools are used in this operation to produce 3,000 pieces per tool grind.

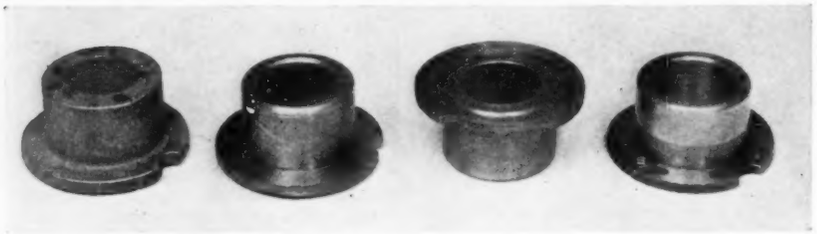
Eight rivet holes with a diameter of 7.32 in., and two draw-screw holes with a 5/16-in. diameter are drilled in the flange. Several types of 20-in. drill presses are used, and 9,000 pieces per drill grind are produced. The draw-screw holes are tapped with a standard ⅜-in. thread, taps generally lasting for 45,000 pieces.

A ¼-in. slot ⅛-in. deep is then broached on the hub hole, using a double broaching machine equipped with a high-speed steel cutter. Average production is 2,900 pieces per day. Barring breakage, due to defective broaches or accidents, the broach cutter bars have on occasion run as high as 300,000 pieces before regrinding. The life of a broach is ended by wear in width which causes undersize keyways. However, in this application, reground broaches have been run an additional 300,000 pieces before discarding.

The final operation is hand reaming, using high-speed steel reamers which finish the hole size to within a tolerance of 0.001 in. Production averages 2,850 pieces per day. Reamers will customarily last two to three weeks per grind by merely stoning the cutting edge slightly which is generally done daily.

Originally another material was used for the hub, but is was found that with the adoption of malleable iron it was possible to increase surface speed about 2½ times; at the same time tool life per grind was tripled.

Fan pulley hubs are shown in four stages. From left to right: rough casting, turned on hub side, turned on flange side, and finally keyseated and drilled, ready for assembly to the pulley



Time Value Formulas Give Consistent Standards

Individual jobs need not be studied in order to establish accurate and consistent time standards for cost and wage incentive purposes

G. J. STEGEMERTEN
Superintendent of Time Study and Methods
Westinghouse Electric and Manufacturing Company

ACCURATE COSTS can be obtained only if the amount of labor necessary to make each job can be measured. The possibility of doing this in factories handling a standard line of work has been recognized widely. Detailed time studies are taken of each operation on each job; these are used not only in connection with wage incentive systems but also for determining manufacturing costs. That the same results can be accomplished on work of a jobbing nature is not so generally recognized.

At first glance the accurate determination of operation allowances on jobbing operations appears impracticable because of the work involved in establishing time standards for each job. In a plant handling a standard line of work, one time study often will lead to the establishment of a time value which will cover the work of several operators for months or even years. In jobbing work, a time value may cover a job which lasts only ten minutes. Obviously, it would be impossible to take time studies on each individual job. Often the temptation is to arrive at an average by collecting data over a representative period of time and establishing values based upon weight or some other general characteristic. This not only is inaccurate, but it also is dangerous; it may lead to the taking of more unprofitable work than profitable.

But it is not necessary to take time studies of each individual job in order to establish accurate and consistent time values. Instead, it is possible to derive formulas which enable one to do this quickly and easily. A formula is nothing mysterious or academic, but merely a convenient way of expressing the manner of variation between two or more interdependent variables. When all but one of the variable quantities are known for a given set of conditions, it is quite easy to determine the value of the unknown quantity by substitution in and solution of an algebraic formula. More specifically, the unknown time for doing an operation covered by a formula may be determined simply by assigning proper values to the variable factors, then solving the equation.

The construction of a time-value formula usually requires from one to four months, depending upon the experience of the time study man in doing this type of work, the records already available and the extent of the poor conditions that are unearthed and corrected during the study. Once developed, however, it quickly pays for itself, for it permits the establishment of accurate time values in a matter of minutes, depending on the complexity of the job. The methods which should be followed are beyond the scope of this article, but those interested can find detailed step-by-step explanations in a number of reference sources.

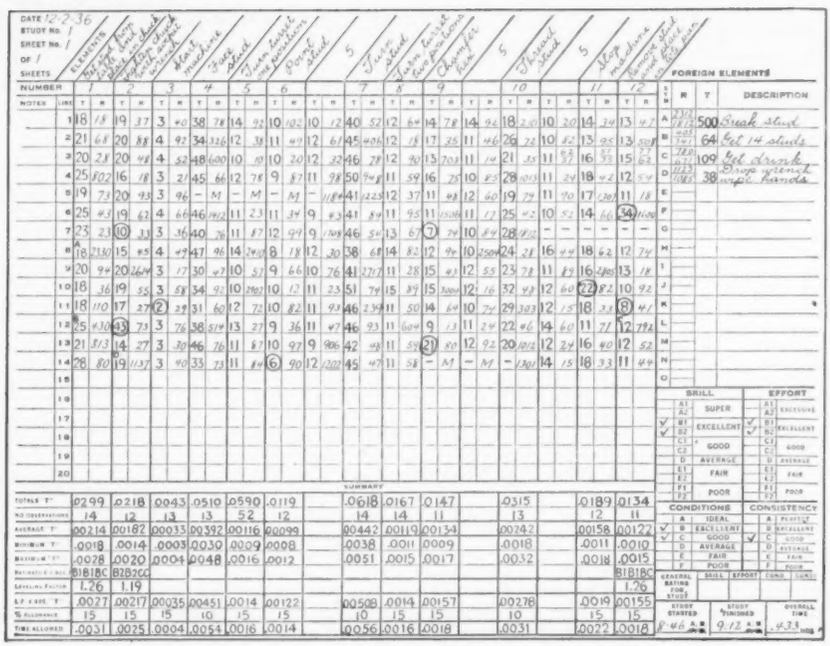
Developing the Formula

To illustrate the development of a formula, suppose that the rough turning of simple shafts or spindles, done on an engine lathe, is to be covered by a formula. These shafts always are of the same material and the same diameter, the only variable being the length, which varies from 10 to 40 in. From a motion study, the time-study man sets up the following sequence of operations as standard:

A—Place shaft in lathe
B—Start lathe
C—Start cut
D—Cut; while cut is being made the worker locates and drills the center holes in the next piece and attaches a driving dog.
E—Stop cut
F—Stop lathe
G—Remove shaft from lathe
H—Lay shaft aside

After a number of shafts have been turned on one end, the above sequence is repeated for the other end. While one shaft is being cut, the dog is attached to the finished end of the next shaft.

From a study of the above list it can be seen that operations *B, C, E,* and *F* should require the same time for a 10 as for a 40 in. shaft and can, therefore be considered constant in value. The remaining operations are called *variables,* since the time to perform each of these operations depends upon the length of the shaft. If each of these variables is plotted against length, *L,* on cross-section paper, the relationship can be expressed by the general equation: $y = b + mx$, where y and x are the variables, b is the intercept on the y axis and m is the slope of the line. These variable expressions can be summed into one general expression. The constant operations *B, C, E* and *F* also can be summed. If this summation is represented by *K,* then the time to turn one shaft com-



Observation sheet used for stop-watch time studies by Westinghouse Electric & Manufacturing Company. Allowed time for each element is computed separately as shown. Time values shown are decimal hours

plete will be expressed by the following equation:

$$\text{Time} = K + b + mL$$

Then, if $K + b = K^1$:

$$\text{Time} = K^1 + mL$$

Thus, it can be seen that after the constants have been determined by time study, it is necessary only to solve the above equation for any length, L, in order to determine the time to machine that length of shaft.

Preliminary Work

The first step in the preliminary work of constructing a formula is to determine the type of work to which it is to apply. This usually consists of a survey of the various sizes, types and styles which are sufficiently similar to warrant their selection for the class of work to be formulated. Later considerations may make it advisable to eliminate certain types, or to include certain other types not originally considered.

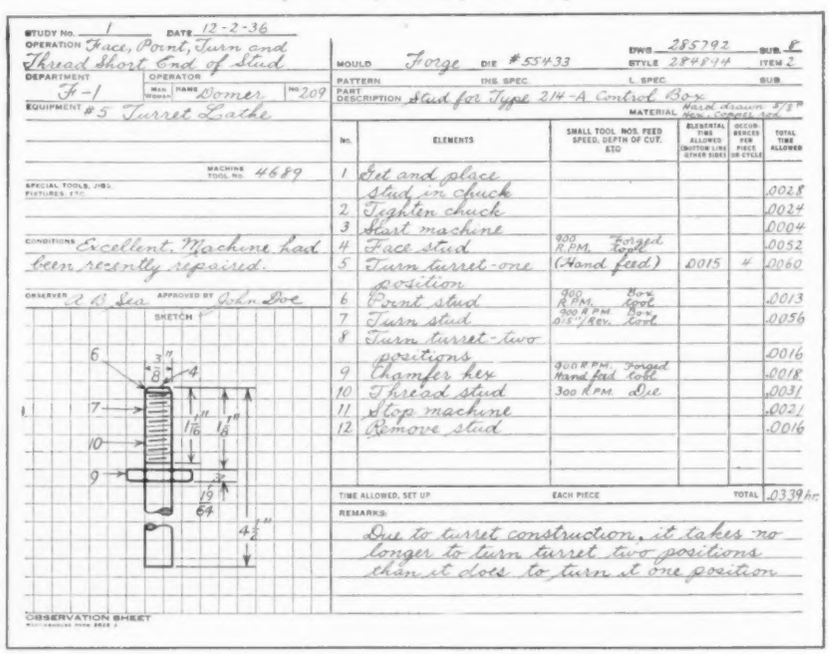
The time-study man next studies the work itself, until he has a clear mental picture of all its phases, and an understanding of all its problems and difficulties. The general plan of the formula is made at this time. An analysis of all existing time studies, and perhaps the making of a few trial studies often aid in arriving at the solution. He then examines all existing time studies and other data covering the work under observation, and determines how much can be used to minimize the work of formula construction. Changes in manufacturing equipment, manufacturing methods, inspection requirements, and incomplete information recorded on the time-study sheet often will result in obsolete and useless records.

Often a set of studies otherwise satisfactory has been rendered useless for formula work because of the lack of some detail which was overlooked, or considered unnecessary when the studies were made. For this reason, we have developed the time-study form shown herewith, providing for the recording of all essential information. It will be noted that the operator is rated for skill, effort and consistency, and for the conditions under which the operation was performed. On this basis the levelling principle is applied, to arrive at a true standard on the basis of the average operator.

All usable data are posted on a master table of detailed time studies. This is a large yellow sheet measuring 22 by 17 inches. Space is provided in the upper left-hand corner for the recording of all important identifying information. Directly below this are a number of columns, the largest of which is used for the operation description. The right-hand part of the sheet is divided into twenty vertical columns marked S-1 (Study No. 1), S-2, S-3, and so on. As the studies are selected for use in the construction of the formula, they are entered in the columns mentioned. Thus, as the work progresses, the time-study man can see how many studies have been made, which operations occur more frequently, which observations are yet to be made and all conditions affecting the performance of the operation.

When the master table is completely filled out, the construction of the algebraic expressions, charts, tabular data and other information to be used in the determination of allowed time is begun. The formula must be so made that it can be

Allowances computed for each element are transferred to the reverse side of the observation sheet. Here, also, is recorded all information necessary to fully identify the study


STUDY No. 1
DATE 12-2-36
OPERATION Face, Point, Turn and Thread Short End of Stud
DEPARTMENT F-1
OPERATOR Mach. Worker NAME Domer No. 209
EQUIPMENT #5 Turret Lathe
MACHINE TOOL No. 4689
CONDITIONS Excellent. Machine had been recently repaired.
OBSERVER J. B. Sea
APPROVED BY John Doe
SKETCH
MOULD Forge DIE #55433
DWG 285792 SUB. B
STYLE 284844 ITEM 2
PATTERN INS. SPEC. L. SPEC. SUB.
PART DESCRIPTION Stud for Type 214-A Control Box
MATERIAL Hard drawn 5/8" Hex. Copper Coil
No. ELEMENTS SMALL TOOL NOS. FEED SPEED, DEPTH OF CUT, ETC ELEMENTAL TIME ALLOWED (BOTTOM LINE OTHER SIDE) OCCURRENCES PER PIECE OR CYCLE TOTAL TIME ALLOWED
1 Get and place stud in chuck .0028
2 Tighten chuck .0024
3 Start machine .0004
4 Face stud 900 R.P.M. Forged Tool .0052
5 Turn turret-one position (Hand feed) .0015 4 .0060
6 Point stud 900 R.P.M. Hex Tool .0013
7 Turn stud 900 R.P.M. .015"/REV. Form Tool .0056
8 Turn turret-two positions .0016
9 Chamfer Hex 900 R.P.M. Forged Hand Tool .0018
10 Thread stud 300 R.P.M. Die .0031
11 Stop machine .0021
12 Remove stud .0016
TIME ALLOWED, SET UP EACH PIECE TOTAL .0339 hr.
REMARKS:
Due to turret construction, it takes no longer to turn turret two positions than it does to turn it one position
OBSERVATION SHEET

SHEET NO. 1 OF 1 SHEETS

MASTER TABLE OF DETAIL TIME STUDIES

FORMULA F-13 #7
DATE MAY 1, 1936
PART ENCLOSING CABINETS
OPERATION LAYOUT PANEL FOR DRILLING & ASSEMBLE PANEL TO BOX
PERFORMED ON BENCH
COMPILED BY J. A. Smith

SYMBOL	OPERATION DESCRIPTION	TIME ALLOWED (HOURS)	REFERENCE		S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13
	STUDY				#1 4436	#2 4436	#1 4436	#1 4534	#2 4534	#3 4534	#5 4734	#2 4734	4732	#1 4836	#3 4436	#1 4436	
	OPERATOR				Hiler	Hiler	Hiler	Gutherz	Gutherz	Hiler	Hiler	Hiler	Gutherz	Gutherz	Hiler	Marion	
	SKILL EFFORT				G E	G E	G E	G A	A A	G G	G E	G G	G G	G G	G E	G G	
	Assemble				✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
	Layout											✓					
	Panel Area				50	168	108	778	280	1275	296	296	575	910	1275	1030	
	Drawing No.				6104A9	37566	43519	42357	41542	37827	37902	37902	40134	40227B	37827	47930	
	How Mounted				STUD	BRACKETS	STUD	CLINE	STUD	BRACKETS	BRACKETS					BRACKETS	
A	Put in one mounting stud complete	Eq #1		V	0150		0135		0198								
B	Put on one name plate complete	Eq #er-3		V	0316	0478	0351		0419							1048	
C	Prepare electric hand drill	0121	S-1	C	0121	0127	0102		0166							0048	
D	Place one rubber washer on stud	0026	S-3	M	0040		0026										
E	Place panel in box	Eq #7		V	0120	0121	0095	0086	0060	0061	0072		0014	0148	0095	0043	
F	Bolt panel to mounting stud per stud	0080	Comp E A	C	0110		0069		0065								
G	Put on one cover lock	0550	Comp E A	C	0519		0534										
H	Remove box	0049	S-7	C			0044		0045	0061	0049	0084	0035	0105	0042		
I	Chalk areas or mark holes for filing	0116	S-11	C		0120						0065	0099	0204	0116		
J	Put in one bolt with wrench	0108	52 & 4	C		0108		0108								0110	
K	Remove panel from box	Eq #8		V		0035		0029			0044				0058		
L	Get box	0075	S-3	C			0075	0062	0039	0091	0065	0121	0071	0222	0116		
M	Get panel from or remove to stock pile	Eq #9		V			0081		0123	0110	0173	0056	0078	0107		0122	
N	Cut off one brass bolt on back of panel	0015	S-3	M			0015		0017								
O	Layout all name plate holes for drilling	Eq #4		V											0355		
P	Fit Panel into position	Eq #10		V				0166	0070	0031	0084		0136			0158	
Q	Set box on floor	0100	S-6	C					0094	0100	0083			0084			
R	Tie or untie tags	0036	Comp E A	C										0053			
S	Cut 1 hole in side of box, finish like different plate comp	2907	S-7	M							2907						
T	Layout + saw one mounting support complete	1249	S-7	M							1249						
U	Layout side hole, center punch and layout piece from	1360	S-8	M								1360					
V	Layout one hole for drilling	0028	S-10	C								0013	0030	0028	0026		
W	Center punch one hole	0039	S-10	C								0015		0039	0061		
X	Chalk mark around one punch point	0008	S-11	C								0010			0008		
Y	Layout + mark one hole in side of box	0298	S-11	M											0298		
Z	Put in switch handle complete	0827	S-6	M						0827							
A1	Put on 1 name plate after holes are drilled	Eq #5 #6		V						0152	0232						
B1	File ream one hole in panel	0144	S-4	M				0144									

No panels fitted properly so mounting time is disregarded on this study

These operations were selected from a study on mounting a Cline controller to eke out available data

Data from individual studies are transferred to a master table for formula construction purposes. As the work progresses, the time-study man determines which operations occur frequently and what additional studies must be made

quickly and easily applied. All tables, charts and expressions should be clear and concise. Common sense must be used in deciding what accuracy is required.

When the formula has reached this stage, the time-study man gives it a thorough test for adequacy. First, he uses the studies from which the data or the formula were taken. He also may make a new series of time studies of representative jobs, comparing the allowed time from these studies with the results obtained from the formula. Also he may apply the formula to jobs on which the allowed times are already existing. When satisfied as to its adequacy, the formula report is started.

It is thought by some that the use of formulas is confined to the field of machine work, where feeds, speeds, depth of cut and the like are the only variables. However, providing sufficient data are collected, practically any line of work may be formulated.

There are four distinct advantages in using formulas. First, by using a formula the time-study man can determine allowed times on a given class of work in a mere fraction of the time required by time-study methods; consequently one time-study man can establish allowed times for a greater number of workmen. Second, when a number of allowed times on similar work are established by time study, inconsistencies are certain to appear, even when exceptional care is taken. The use of a formula will rationalize the allowed times, since they are all derived from the same data.

Third, the estimated times on new or undeveloped work are more easily obtained when derived from a formula. If a formula has been constructed on a line of work it is no longer necessary to estimate labor cost by comparison with other jobs, or guesses based only upon judgment; but, in the majority of cases, the information required for use in the formula will be on the drawing and the estimates will be the same as the actual values which will be set on the job when it comes through. In one plant, the estimates actually are made out on forms which later serve as instruction sheets.

Fourth, a formula can be constructed to apply to any type of work which can be measured. For this reason it has made possible the determination of accurate allowed times where ordinary time-study methods would have been too expensive. In the so-called "job shop," that it, a shop where there are a large number of orders with only a few parts on each order and no two orders exactly alike, time study, as a means of determining time allowances, would almost be prohibitive in cost. In the past such shops have used very crude methods of time setting, or none at all. With carefully constructed time-study formulas, the allowed times can be determined quickly and accurately.

After a little practice, the time study man becomes expert in handling his formulas and reading his curves and it is not difficult for him to establish all time values for producing a given part in a few minutes.

TIME-DATA REFERENCE SHEET SERIES INAUGURATED

On the three succeeding pages are the first of a new series of *Time-Data Reference Sheets*. These have been contributed by outstanding metal-working concerns as a record of allowances made for operations common to most shops in the fields served by *American Machinist*. It must be recognized, of course, that these values represent time allowances for operations performed on equipment in use in the contributor's plants under conditions that probably are peculiar to that particular plant.

It is not recommended that any of the allowances given in this series be applied to similar operations in your own plant without first careful checking of the values with operating conditions in the plant. Differences in tools, jigs, fixtures, machine arrangement, part handling facilities and other factors will have a governing effect upon the applicability of these data.

AMERICAN MACHINIST *Reference Book Sheet*

Time-Data Sheet No. 1

Part Handling by Hand and Jib Crane—I

PART:

Part handling by hand and jib crane.

OPERATION:

Pick up part and put on table, in vise or in jig or fixture; tighten vise, or fixture; release vise, jig or fixture; turn part over on table or in vise; remove part from table, vise, jig or fixture and lay aside.

LOCATION:

East Pittsburgh Works, Westinghouse Electric & Mfg. Co.

Description of Operation	*Allowed Time*
Pick up part and put in jig or fixture, or remove from jig or fixture and lay aside carefully	See Curves
Pick up part and put on table or in vise, or remove from table or vise and lay aside carefully	See Curves
Remove part from jig or fixture and toss aside	See Curves
Remove part from table or vise and toss aside	See Curves
Release vise	See Curves
Turn part over on table	See Curves
Tighten vise	See Curves
Turn part over in vise	See Curves

Description of Operation Element	*Allowed Time Std. Hours*
Open and close cover of jig or fixture when hinged	0.0008
Close cover of jig or fixture when hinged	0.0003
Open cover of jig or fixture when hinged	0.0005
Put on and remove cover of jig or fixture when not hinged	0.0029
Put on cover of jig or fixture when not hinged	0.0020
Remove cover of jig or fixture when not hinged	0.0009
Tighten and release wing nut	0.0012
Tighten and release thumb screw by hand	0.0013
Tighten thumb screw by hand	0.0008
Release thumb screw by hand	0.0005
Tighten and release one short locating screw by hand	0.0018
Tighten one short locating screw by hand	0.0010
Release one short locating screw by hand	0.0008
Tighten and release two short locating screws by hand	0.0023
Tighten two short locating screws by hand	0.0013
Release two short locating screws by hand	0.0010
Tighten and release one long locating screw by hand	0.0037
Tighten one long locating screw by hand	0.0021
Release one long locating screw by hand	0.0016
Tighten and release two long locating screws by hand	0.0047
Tighten two long locating screws by hand	0.0027
Release two long locating screws by hand	0.0020
Tighten and release locating screws with a wrench	0.0053
Tighten locating screw with a wrench	0.0035
Release locating screw with a wrench	0.0018
Tighten and release hexagon or square nut with an open-end wrench	0.0034
Tighten hexagon or square nut with an open-end wrench	0.0018
Release hexagon or square nut with an open-end wrench	0.0016
Insert and remove bushing from jig or fixture	0.0010
Insert or remove bushing from jig or fixture	0.0005
Insert and remove locating pin from jig or fixture	0.0046
Insert locating pin in jig or fixture	0.0018
Remove locating pin from jig or fixture	0.0028
Blow cuttings from small or medium jig or fixture with an air hose	0.0014
Blow cuttings from large jig or fixture with an air hose	0.0020
Clean small jig or fixture with brush	0.0020
Clean medium jig or fixture with brush	0.0028
Clean large jig or fixture with brush	0.0035
Clean very large jig or fixture with brush	0.0049
Clean small jig or fixture by turning over	0.0014
Clean medium jig or fixture by turning over	0.0022
Clean large jig or fixture by turning over	0.0029
Clean very large jig or fixture by turning over	0.0043
Tighten and release a machine vise, hit part with a rawhide mallet	0.0043
Tighten vise on machine with rawhide mallet and hit part	0.0031
Release vise on machine with rawhide mallet	0.0012
Clean vise	0.0020
Set and tighten, release and move clamp already in place	0.0059
Set and tighten clamp already in place	0.0035
Release and move aside clamp in place	0.0024
Place, set and tighten, release and remove clamp not in place	0.0116
Place, set and tighten clamp complete	0.0076
Release and move aside complete clamp	0.0040
Set jack screw	0.0021
Make jib crane lift from machine to turn part and return	0.0250
Make jib crane lift from floor to lathe and return	0.0500
Make jib crane lift from floor to machine table and return	0.0622
Make jib crane lift from floor to jig or fixture and return	0.0779

APPLICATION:

This formula applies to all part handling with a jib crane and by hand, except where the length is very great in comparison with the cross sectional area, as bar stock.

Note: The term "allowed time" used in these and following data represents the time required by any worker to perform a given unit of work, using average skill, showing average effort, under average conditions, with average consistency, allowing for fatigue, personal needs and unavoidable delays. *It is the time within which the worker is expected to perform that work.* All times are given in decimal hours. Accurate conversions to minutes and seconds can be made by means of the following formulas: Decimal hours X 60 = decimal minutes; decimal hours X 3600 = decimal seconds. The data given represents standards developed for use at East Pittsburgh Works of Westinghouse Electric & Manufacturing Company for conditions of work existing in that plant. Each allowance should be checked in the light of local conditions before being applied in any other plant.

AMERICAN MACHINIST *Reference Book Sheet*

Time-Data Sheet No. 2

Part Handling by Hand and Jib Crane—II

ANALYSIS:

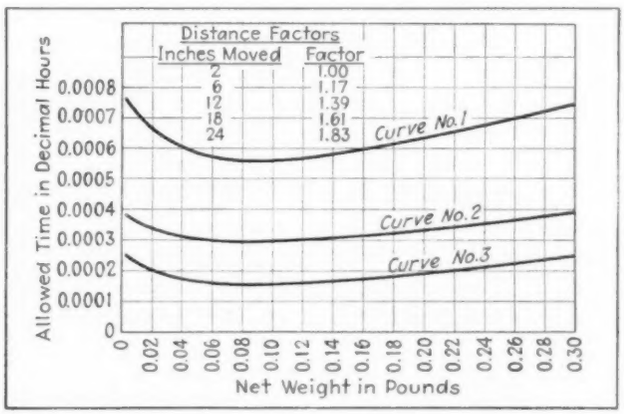
This formula has been constructed with the objective of standardizing part handling times in all departments, thus making the information and formulas of general value to the East Pittsburgh Works. Variations have developed in the past because of the different classes of work performed in various departments and because of individual opinions. The data has been compiled from studies taken on actual production jobs in several shop sections and studies taken with ideal setups in order to show how various factors affect the time. Constants were selected from a wide range of formulas and time studies. The time values obtained from this data are to be used in formulas or standard data developed for a wide range of shop operations, as too much time would be involved in establishing "each piece" values directly from this information.

Classification of Parts

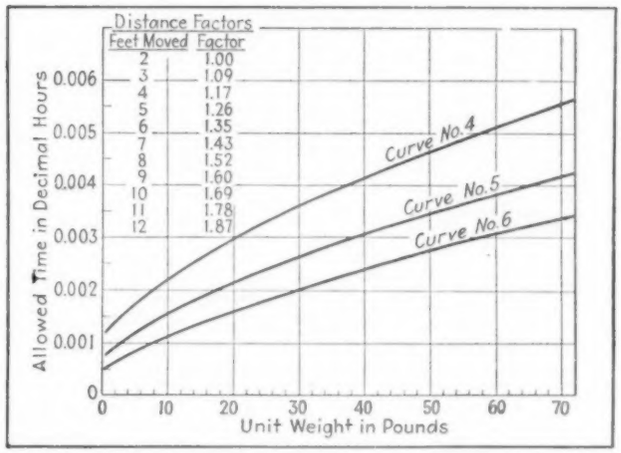
Parts always should be placed so that they can be handled to the greatest advantage, without interfering with the movements of the operator. In some cases skids, skid boxes, trucks and other materials handling units may facilitate the handling operations. They always should be introduced where advantageous.

No binding rule has been made to govern the weight of the load that a man shall lift. The maximum load that a man should lift under any conditions has arbitrarily been chosen as 75 lb. This does not mean that an operator can be compelled to lift 75 lb. by hand. In fact, this should be attempted only under good conditions and with known assurance that the operator is physically able to make the lift and that it is not a frequently occuring operation. Parts have been classified as follows:

Very small	0– 0.50 lb.
Small	0.51– 5.00 lb.
Medium	5.01–20.00 lb.
Large	20.01–45.00 lb.
Very large	45.01–75.00 lb.
Handle mechanically	Over 75.00 lb.



These curves apply only to the handling of parts which involves finger, wrist and arm movements. Curve No. 1 shows allowance for time to pick up a part and place it in a jig or fixture. Curve No. 2 is read both for time allowed to pick up a part and place it on a table or in a vise, and for time allowed to remove the part from the jig or fixture and lay it aside. Time allowed for laying a part aside is read from Curve No. 3. Distance factor is to be applied in all cases



These curves apply to the handling of parts where movements of finger, wrist, arm and body are required. Time allowed to pick up a part and place it in a jig or fixture is read from Curve No. 4. Curve No. 5 shows both time allowed to pick up a part and place it on a table or a vise, and time allowed to remove a part from a jig or a fixture and lay it aside. Curve No. 6 is read for time allowed to lay a part aside. Each reading must be multiplied by the proper distance factor

It should be understood that the person applying these values will be governed by some of the limitations outlined below and by a practical knowledge of a man's ability. Physical makeup varies just as does a man's other characteristics—what one man is physically able to do, others are not. A majority of men able to work will be able to lift 75 lb. straight up. As the distance between the load and the position of the operator increases, the size of the load any one man can lift will decrease.

Where there is danger of a man injuring himself, as around acids, hot water or metals, oily floors or running machinery, the maximum load lifted should be decreased to meet the conditions of the job. Frequency of occurrence, distance of lift, nature of part to be lifted and the operation to be performed on it should determine the maximum weight to be lifted in each case.

Jib Crane Lifts

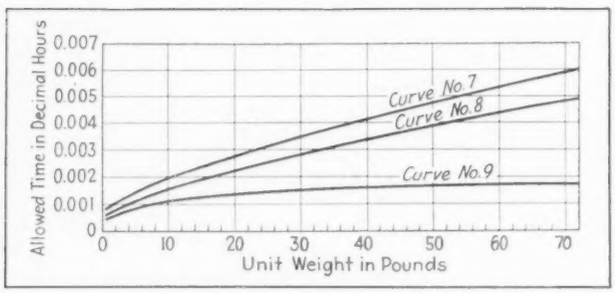
Values have been established for jib crane lifts from the floor to a lathe, machine table, or a jig or fixture and return, and for lifting a part from a machine to turn it with a jib crane. The majority of jib cranes now used in the shop are electrically driven, so the time values have been established for this type of hoist. Air hoists run at a greater speed than electric hoists, but they are used only in cases where there is a fire hazard. Around dip tanks or spray booths where a spark from a motor might ignite a gas, they are used exclusively. An investigation in the shop showed that chain blocks are used very infrequently on production jobs. On account of this low activity, no separate values have been established for this type of lift.

Speeds at which electric hoists operate under load has been found to vary from 36 ft. per min. for a ½-ton hoist to 15 ft. per min. for a 1-ton hoist. When making a lift, only the straight up lift is affected by the speed and capacity of the hoist, as the jibs all are swung by man power. This being the case, 5 ft. will, in most cases, constitute a maximum distance of lift. Considering a constant load, it would take

AMERICAN MACHINIST *Reference Book Sheet*

Time-Data Sheet No. 3

Part Handling by Hand and Jib Crane—III



Curve No. 7 is read for time allowed to turn a part over in a vise. Both time allowed for turning a part over on a table and that allowed for tightening a vise is shown by Curve No. 8. Time allowed to release a vise is read from Curve No. 9. These operations are affected only by the weight of the piece

the ¼-ton hoist 0.00232 hr. to make a 5-ft. lift and the 1-ton hoist 0.00557 hr. to make the same lift. This is a difference of 0.00325 hr. each way between the maximum and minimum times. This formula allows 0.0500 hr. for a jib crane lift from floor to lathe and return; 0.0622 hr. for floor to machine table and return; and 0.0779 for floor to jig or fixture and return. From these figures it can be shown that the maximum variation for the operation of crane lift can only be about 13 per cent. When it is considered that the total time value will be considerably greater than the value for crane lift only, it can be seen that this percentage will be decreased appreciably.

A study of lifts made with overhead cranes showed that it would not be practical to establish standard values for this type of lift. This is due to the variations in the size and speeds of the cranes, waiting time variations in different parts of the plant, and variations in methods for "hooking on" different kinds of apparatus. Each application thus requires separate consideration.

Curves Developed from Special Studies

It has been mentioned that some of the studies on which the accompanying data are based were taken with "ideal" set ups. This was done to more definitely determine just how the distance moved and changing volume or cross sectional area affected the time taken. Parts of approximately similar shapes but with increasing weights and volumes were chosen. These parts then were moved to a vise and returned by a selected operator. The distances the parts were placed from the vise were carefully measured and recorded on the studies. Each piece was moved through the various distances. Resulting data showed that the distance a part was moved affected the time materially, the time increasing as the distance moved increased. A factor curve was plotted from this information.

Parts of approximately the same weight, but with varying volumes and cross sectional areas next were selected. These too were moved through various measured distances. The resulting data showed that the handling time was not materially affected by changing volume or cross sectional area as long as the distance moved was constant and the parts varied within ordinary working limits. Bar stock would not be considered as coming under this classification, but castings, forged parts, short bars, bars where the length is not great with respect to the cross sectional area, and fabricated parts would be so considered.

Handling time for a jig or fixture is the same as for any other part of the same weight. Jigs or fixtures are classified according to the parts which go into them, i.e., a jig for a small part is a small jig; a jig for a medium part is a medium jig.

Values have been established for long and short locating screws. A short locating screw is considered as one which has to be moved ¼-in. or less, while a long locating screw is one which has to be moved a greater distance. A long locating screw is necessary only where clearance has to be made for putting a part in a jig or fixture. In most cases, where there is more than one screw in a jig, they can be tightened two at a time. This possibility always should be investigated and time allowed per pair rather than for one where conditions permit.

In some cases it is possible to handle more than one part at a time. Although this fact is recognized, no allowance has been made for it in this handling data. So many different variables enter this plan that accurate data would be unwieldly for general use. The place and manner in which the parts are stored, the use to which they are put, the shape of the parts and methods of handling must be taken into consideration. It will be necessary for each individual applying this data to take care of such cases when they arise.

CURVES:

Curves for handling time allowances will be found in the accompanying data. These operations are divided into two classes: first, those which are affected by the distance moved and, second, those which are not. Curves No. 1, 2 and 3 are for small parts up to 0.30 lb. where finger, wrist and arm movements only are involved, while curves No. 4, 5 and 6 are for parts where finger, wrist, arm and body movements are involved. These curves are based on minimum distances in both cases and the values obtained from the curves must be multiplied by the distance factor given with each set of curves. Curves No. 7, 8 and 9 are for those operations which are not affected by the distance moved.

Those curves showing time values for part handling operations that are affected by distance all follow the same general trend. There is a slight decrease until an ideal size part is reached, then a gradual increase as the weight increased. Very small parts are difficult to handle, but as they increase in size and weight the difficulty is lessened. Handling time is least when the ideal size is reached.

When parts are to be placed aside carefully, for instance packed in a pan, the time for placing aside is the same as the time for picking up. When the pieces can be tossed aside in any manner, the time for placing aside is materially reduced.

Curves for turning pieces over on a table or in a vise, and for tightening and releasing the vise also follow the same general trend. Due to the fact that it was not possible to get information for performing these operations on very small parts, only one set of curves has been made. Time required increases as the weight of the part increases. When tightening or releasing a vise, the effort required to hold a small part in or remove it from a vise is slight. As the part increases in size, however, the difficulty and time required to perform the operation increases.

When selecting values for handling time from this data, the average distance the parts have to be moved for the general type of work should be considered. With this in mind, values can be selected from the curves and used as constant handling values. Any necessary percentages for cleaning, oiling or like operations may be added directly to these values.

PAYMENT:

The time allowances obtained from this formula can be used with any wage-incentive system now in use at the East Pittsburgh Works.

DAD SAYS

We Had an Open House, Too

WELL, SIR, last week we had a near riot in the plant. I never saw human nature stick out of so many people, so far and so often before in my life.

They had what they called an "open house." That is, they cleaned up the plant like it was never cleaned up before—got samples of all the stuff the men work on and made exhibits in each department. Then on Saturday they invited the men to bring the wives and kiddies down and show them what it was all about.

In a lot of ways it was a good thing. First, because it certainly did get the old place cleaned up and then too, it made a lot of the foremans figure out just what their job was in order to make all those exhibits.

But there were some other good things about this stunt. It gave the men a chance to really "strut their stuff." You know most of the time a man is in the wife's shop. She's always showing him this or that, and of course she never misses a chance to point out to him what a tough job she has. But all the old man can do is to talk about his tough job. Last Saturday, though, the men were doing all the showing. And did they enjoy it! I'll say they did!

When it came to the kids—this was the old man's chance to really show them what a smart fellow their father was, and most of them did a good job at it, too.

Of course there were some kickbacks when the wife couldn't figure out why the old man had to come home so dirty from such a nice clean place, or why he thought he had such a tough job; but all in all, it was a great thing. Certainly it was a lot more fun than a strike, even if it wasn't as exciting.

Funny, ain't it, that the company doesn't give the men more chances to blow themselves up like peacocks when all the bosses must know that all men, as well as all peacocks, enjoy it.

Dodge Transmissions

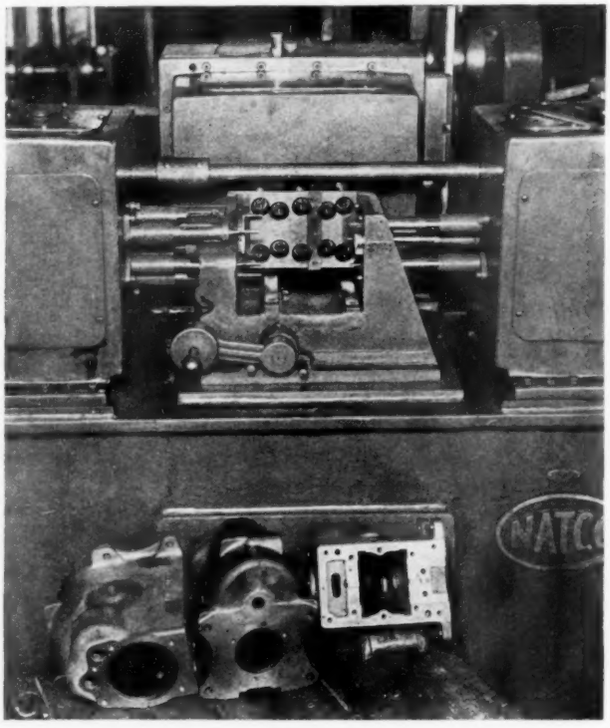
ATHEL F. DENHAM
Detroit Editor, American Machinist

COMPLETE transmissions for Dodge cars, produced at Chrysler's Kokomo plant, require a number of manufacturing operations in addition to those for the gears, which have been described recently, (*AM*—Vol. 82, page 466). Case castings, shifter mechanism units and other parts are machined on the second floor of the plant and delivered by conveyor to the main assembly line on the same floor.

Standard machines are used wherever possible, many of these being equipped with special jigs and fixtures to insure accuracy and make the work easier for the operator. In machining transmission cases, as in the gear line, the main bores are the major locating points. These are finished after the ends and top of the case have been machined in a rotary, vertical milling machine.

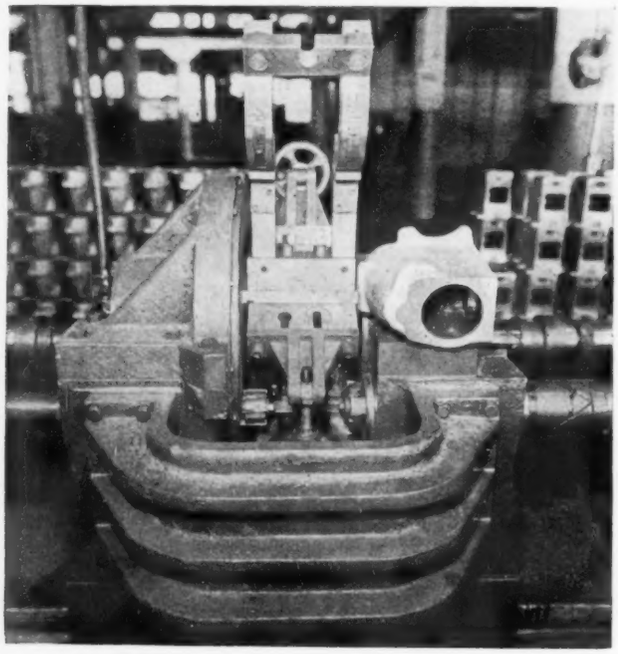
After boring, the case is line-reamed from both ends and then delivered to a line of drilling and tapping machines. Most of these are single-spindle units, the only exceptions being a three-way machine for drilling holes in the top and both sides of the case, and a multiple spindle tapper. Jigs for the drilling and tapping operations have locating pads or plungers that engage the bores of the case to insure rapid alignment of the part.

Minor transmission parts are made in a number of interesting setups, one of these being the use of horizontal surface broaching machines for practically all of the operations on shifter rails and forks. A group of two automatic, multiple-spindle lathes and two cylindrical grinders are set-up for the front bearing retainer. These parts are turned, bored and faced, then ground on the outside diameter of the shank.



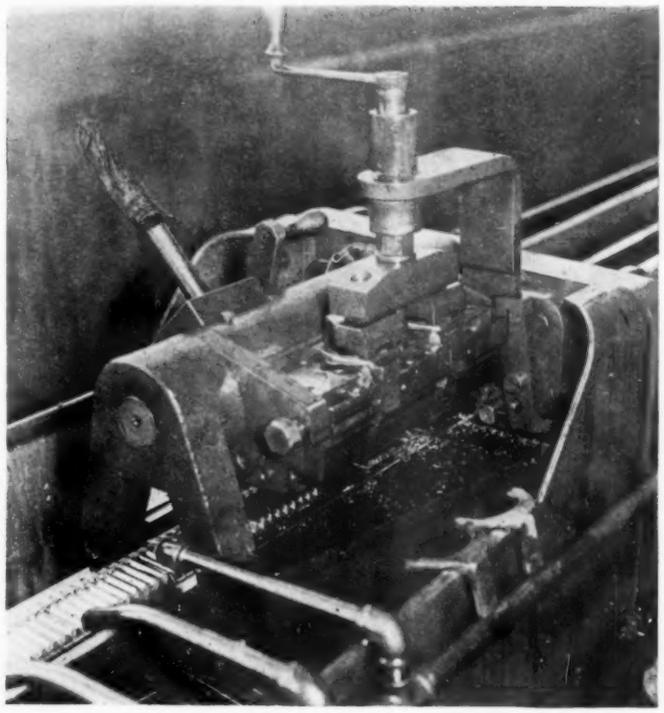
Most drilling and tapping operations on the case are performed on single-spindle machines. One of the two exceptions is this set-up for tapping all holes in the top and ends of the case. Location is primarily from the bores, left- and right-hand heads being fitted with plungers which move toward the center

Main bores of Dodge transmission cases are major locating points and are the first surfaces machined, with the exception of the ends and top. After boring, the case is rough and finish line-reamed from both ends on a three-station, double-end boring machine. Fixture is shown open in the finishing position

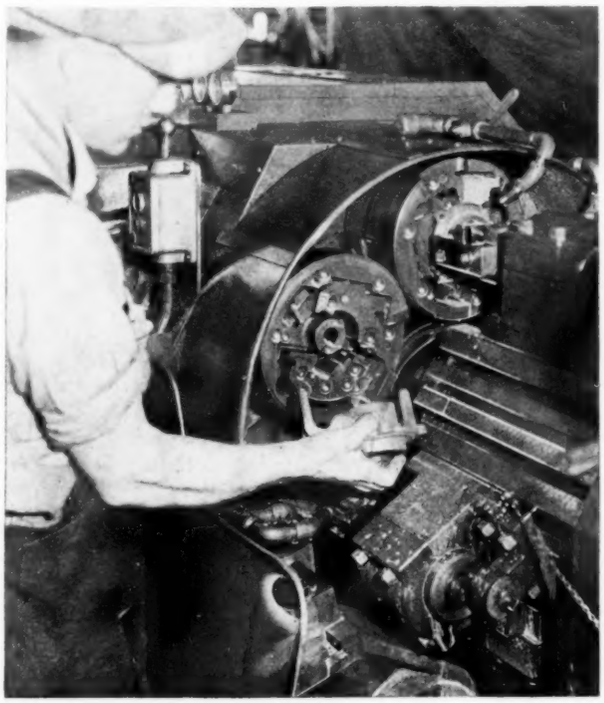


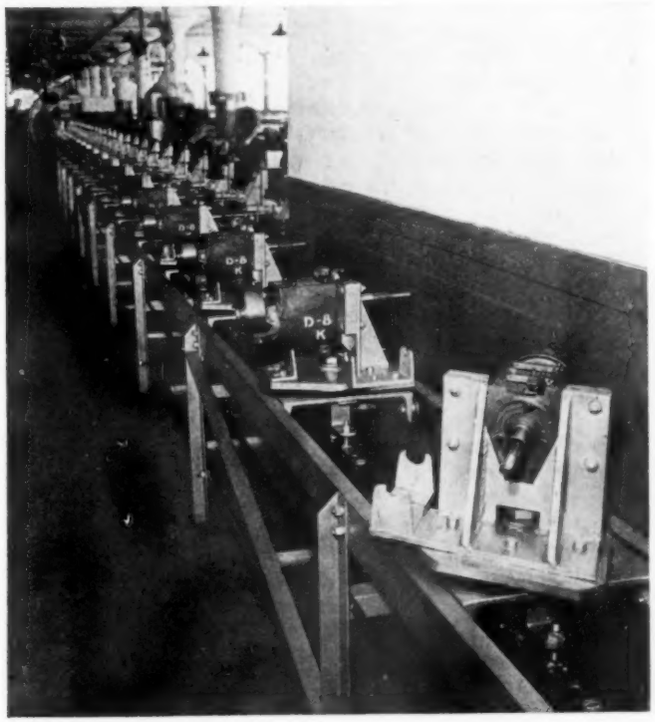
Produced in Kokomo

Virtually all shifter-rail machining operations are performed on horizontal broaching machines. Five surfaces are machined on two rails and two shifter forks at one pass in one of the machines. Shifter yoke then is surface broached in this machine prior to riveting to the rail. Fixture is trunnioned and two pieces are finished per cycle

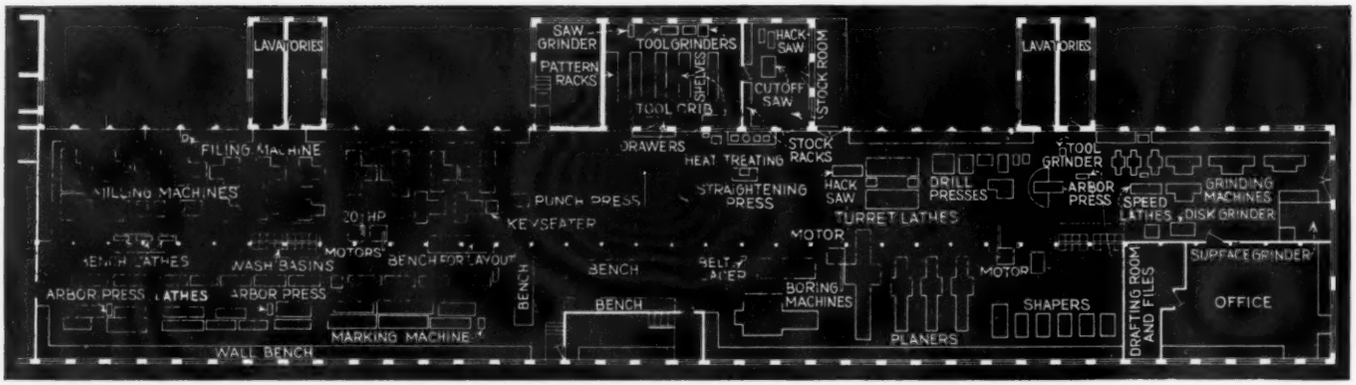


Special chuck has been developed for holding the irregularly shaped brake-support while machining. This chuck grips the piece at four points to insure accuracy





Assembly of Dodge transmissions is performed on a continuous conveyor line. This conveyor is equipped with assembly fixtures which can be rotated through 360 deg. and are spring-locked in several positions



Planned for a Purpose

This contract shop didn't "just grow" like many in its field but as the result of a well conceived plan followed from the ground up

CLIFFORD H. FRENCH

THE LAYOUT of jobbing shop equipment, office and laboratories, is frequently handicapped by a building which was originally intended for entirely different purposes. No such handicap exists in the building illustrated as it was designed to suit a planned layout.

The building proper is approximately 300 ft. long by 55 ft. wide. The sizes of the other details can be readily estimated from these dimensions. The supporting columns are along the center of the shop.

As in most shops in which a variety of work is handled, the machines are for the most part grouped into departments according to the operations performed. Lathes and milling machines occupy one end of the shop. Planers and shapers are grouped together along the outside wall with horizontal boring machines nearby. Drill presses, both vertical and radial, and turret lathes are placed opposite the planers. The grinding machines are placed in the corner near the office. It will be noted that arbor presses are located at various points as needed. A speed lathe is placed near the grinders. Other miscellaneous machinery, such as marking machines, filing machines and tool grinders, are placed in convenient locations. Bench space has been provided both along the walls and wherever needed through the center of the shop. The layout benches are placed near the machines requiring that sort of work.

Power in most cases is obtained from electric motors which operate sections of the shop by the group drive system. Larger machines have individual motors. Since the original layout the tendency in this plant has been to equip nearly all machines with individual motors. This is considered particularly desirable in a contract shop because of the wide variety of work that has to be handled. Individual motor drive is also more satisfactory for overtime work when only one machine or operation is required.

This layout does not show facilities provided for handling material. Overhead cranes are provided for the machines that handle heavy work such as the planers and boring machines. Hoists were also provided at various points to facilitate the handling of work and heavy machine parts. This saves time and conserves the energy of the men adding to their comfort and leaving them in better condition for doing accurate work.

One of the principal advantages of having a shop built according to original specifications is that any extraneous departments or rooms may be placed outside of the regular working areas. The tool crib and the raw stock room and the lavatories, as in this layout, can be placed beyond the regular walls of the working room and do not offer any obstructions. Dark corners and inefficient areas are also eliminated.

Depreciation on the Deep

Probably a great deal of the trouble experienced by the railroads and by some of the country's metal-working plants, burdened with obsolete equipment, would have been avoided had the same realistic view regarding depreciation now followed by the Cunard Line been taken. The *Queen Mary*, regarded as the last word in super-liner construction, is being written off at a rate of near-a million pounds a year in order to reduce her to scrap value when she is 25 years old. Plans are also being made for writing off, out of earnings, the new *Queen Elizabeth* and the *Mauretania* not yet launched. This policy will enable the line to maintain a building schedule to keep its fleet continuously modern.

ROUND TABLE

"Sore Thumb"

"What's the grand idea of glorifying your scrap pile, Al? That white display board you've set up near the time clerk's desk sure has some perfect examples of dumb workmanship hung all over it. I can't see, however, that its the best way to tell your customers about the good work your men can do—and you have one or two visitors down in that part of the shop almost every day."

"I'm not worrying about our customers seeing that board, Ed. In fact I take them over and explain why it's there before they get out of the shop. Haven't had a complaint from any of them, either."

"So you're proud of the scrap you turn out, Al? Times sure have changed a lot; I'd think you would want to soft pedal any story about poor workmanship."

"Ed, that board really tells two stories; first, we prove that our inspection is good, and we can catch any part that isn't up to specification and, second, we tell our men how much it costs the company when one of them falls asleep while doing a job. Did you notice that every

piece on that board has a tag explaining why the piece was scrapped and how much we lost?"

"Yes, Al, I looked it over carefully—and I'm still wondering what good you're going to accomplish by bringing every sore thumb out into the open. Wouldn't it be best to talk to the men individually when they scrap a job?"

"We do that, Ed—but we want the board to serve as a reminder."

Do displays of scrapped work help reduce losses, or does the novelty soon wear off?

DISCUSSION

Spite Fence

"Al would have been wise if he had taken the job and gone ahead without planning on using his competitor's drill jig, even if the extra cost of a new jig meant shaving the profit on the first job," writes Robert S. Alexander in discussing Al's recent difficulties with Sam Wilcox. Mr. Alexander continues by pointing out that: "Al should rely on careful workmanship on the Tilden order to bring repeat business and so liquidate the extra expense involved in making a jig for the work. As events transpired, Al left himself more or less at the mercy of Wilcox when he counted on purchasing the jig."

G. McCardle, in discussing the same question, writes to say that: spite fences have no place among sensible men and Sam's refusal to sell the drill jig was most foolish. Sam should have profited by the knowledge that someone else was getting his work and should have made an effort to find out why he had been turning out poor work.

Preventative Maintenance

"While it may be argued that the budget should be reduced during slack periods, it is false economy to neglect equipment and take a chance on breakdowns later when the plant is busy" writes Nils H. Lou, tool room foreman, The Glenn L. Martin Company. "Not only does maintenance during slack periods provide work for a number of men that otherwise would have to be laid off, but a machine overhauled during such a period often turns out to be equally as good as a new machine. The foreman in charge of the repair gang is not tied up with production problems and has time to supervise the job properly." Writing in much the same vein, Rudulpf L. Behounek, general machine supervisor, Western Electric Company, Cicero, Ill., points out that major repairs often must be put off until a slack period, since equipment must be kept running by any possible means during a rush period.

Train in Vain

R. G. Hewitt of Huddersfield, England, points out that: "Ed's troubles are bound to arise wherever the shop is not large enough to warrant a separate school for training apprentices. For many years I have noted the ability of certain foreman to develop good workmen from the apprentices placed in their departments. Promising youngsters soon are spotted by the management and transferred to better jobs in other departments, their places being filled by raw recruits. This goes on, if the foreman's spirit is not broken, until one department can become the training ground for the entire shop. Departmental efficiency should receive careful consideration before good men are shifted."

On the other hand, says W. L. Waterhouse of Bristol, England, the success of any business can be gaged only by its over-all efficiency and not by the success of individual departments. It would be a short-sighted policy for any foreman to try to hold one of his men whose services could be used to better advantage in some other department. "The foreman who thinks in terms of his department only hardly is in a position to criticize the management," writes A. D. Mackinnon of Lanarkshire, Scotland. "Good men, no matter how old, cannot be passed over indefinitely and discontent grows if advancement is delayed too long. It is much better for Ed and his company to promote promising youths than to see them carry the fruits of their training to a competitor where their usefulness may be appreciated."

IDEAS FROM PRACTICAL MEN

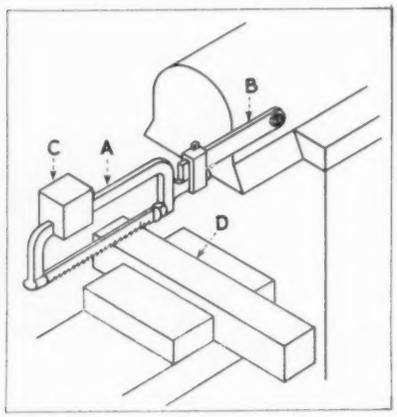
Sawing in the Shaper

FRANK C. HUDSON

A small job shop rigged up the power hacksaw attachment as shown in the illustration. The hacksaw frame *A* was clamped to the bar *B*, attached to the side of the shaper ram as indicated. A block *C*, held on the hacksaw frame at any point, gave the necessary weight for the feed.

The work, a square bar in this case, is held in the regular shaper vise. Position of the work with relation to the saw can be adjusted by moving the shaper knee up, or across the face of the shaper frame.

In the shop where this was seen



This hacksaw attachment is quickly attached to or removed from the ram

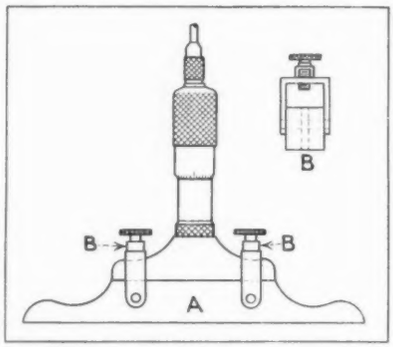
the shaper was of small size but this need not affect the application where it is needed. When not required the saw can be readily removed, leaving the shaper entirely free for its regular uses.

Adapter for the Depth Micrometer

GERALD T. MARRON

An adapter for lengthening the 2-in. base of a micrometer depth gage to 4 in. is shown in the sketch.

Some of my work makes it necessary to have a depth gage that will span a 3-in. hole in order to measure its depth. Since my depth gage has a



The adapter provides a longer base for the depth gage. Its height is equal to the distance between the notches in the measuring rod.

2-in. base and I did not care to buy another one having a longer base, I made the adapter *A* and attached it to my depth gage by the two hinged yokes *B*. The adapter is 0.500 in. high which is the same as distance between the notches in the measuring rod, so that before starting to measure the depth of a hole with the adapter in place, it is necessary to lower the measuring rod one notch farther than usual to bring its lower end flush with the bottom of the adapter.

Tool for Drilling Tubing Without Burrs

M. G. MONROE
Mills Novelty Company

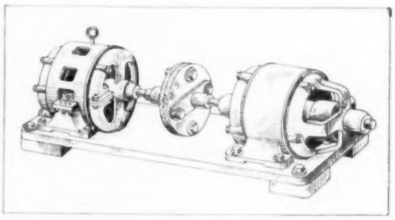
We are often confronted with the problem of drilling holes in round seamless tubing. These holes may be as much as 12 in. from the end of the tube, which makes it difficult to remove the bur. So we designed and had built a cutting tool which solved the problem.

The sketch shows the trepanning cutter, which has a plunger inside the tool. A strong spring always presses the plunger against the slug being cut out of the tube. As the metal gets thin under the teeth, the plunger pushes the slug inside the tube slightly and the teeth cut against the hole and not against the slug. By this means the slug and burr are kept intact until the teeth break through at the periphery of the hole.

Flexible Coupling Made From Rag Wheels

CHARLES H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

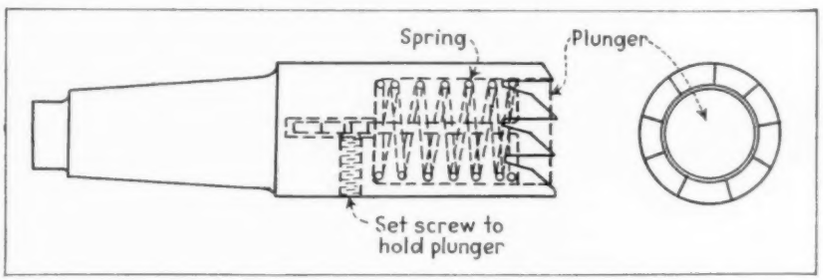
While there are many types of flexible couplings on the market, the one illustrated is the simplest one I have ever seen. It may not



The flexible member is two rag buffing wheels held between the respective shafts by ordinary bolts and nuts through bars at right angles to each other

be new, but I think I can rightly lay claim to its origin.

The flexible member is simply two old rag buffing wheels held



A plunger inside the tool is the kink that prevents a burr when drilling seamless tubing

between bars at right angles to each other by ordinary bolts and nuts, one bar being attached to the armature shaft of the motor and the other to the drive shaft of the machine. The washers next to the fabric of the buffing wheels are extra large.

We have had a coupling of this type in use in a motor-generator set for more than a year and it is still giving good service. Since there are many uses for flexible couplings, some of the readers may find this one handy, especially where a flexible coupling is needed in a hurry.

Bench-Type Crimping Fixture

WILLIAM B. GREENER

The bench fixture illustrated is for attaching bezels to the cases of instrument panels. The cases have ten projecting prongs which are crimped to the bezels at an angle of 45 deg. to hold them in place. The fixture consists of the steel plate *A;* the body *B;* the ten crimping levers *C;* the cam plate *D;* the bushings *F;* the liner pins *H;* the link *I;* and the solenoid *K*, which is the push type.

Plate *A* is mounted on the body, the inside of which is machined to fit the case, the case being located between blocks in which are slots for the crimp-levers. The crimping levers are offset pivoted, permitting them to hang out of the vertical and clear the work when not in contact with the cam plate. The liner pins are a sliding fit in the bushings attached to the cam plate. The link is attached to the bottom of the cam plate and connects it with the plunger of the solenoid, which is operated by a foot-controlled mushroom-type switch (not shown). Plate *A* is attached to the bench and the necessary holes are cut in it and in the bench to permit the lower parts of the fixture to pass through.

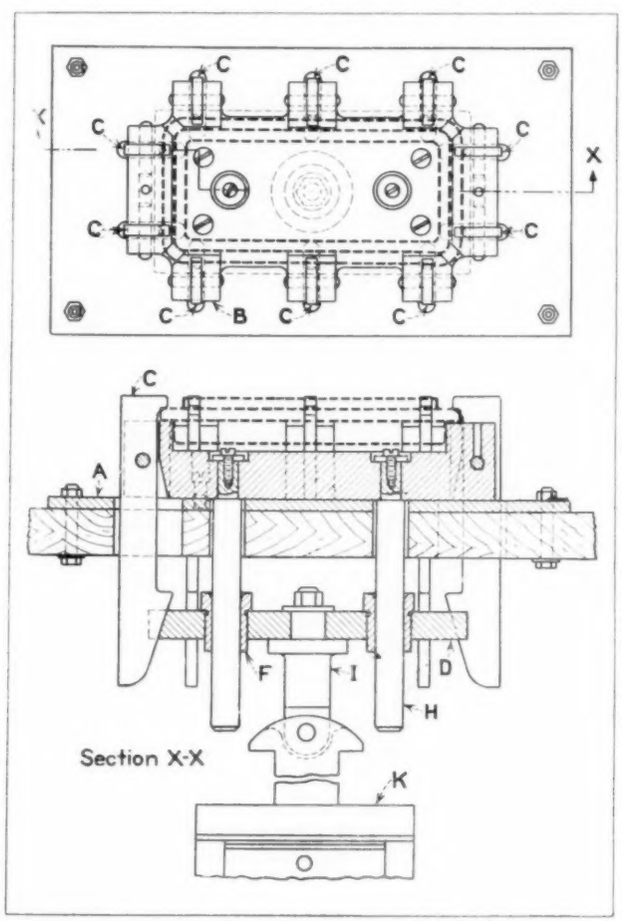
In operation, with the crimping levers in the open position, the cam plate down and a case and a bezel in correct location, as indicated by heavy dotted lines, the switch is closed by the foot, energizing the solenoid coils and causing the plunger and the cam plate to move upward. Pressure of the cam plate on the levers forces them outward at the bottom and inward at the top and starts them to crimp the prongs on the bezel. Crimping is completed when the cam plate reaches the top of its stroke and the crimping levers are vertical. Upon releasing foot pressure from the switch pedal, the current is broken and the plunger and the cam plate slide down by gravity and the crimping levers swing out of contact with the work, which can then be removed.

Drill Jig for Awkward Part

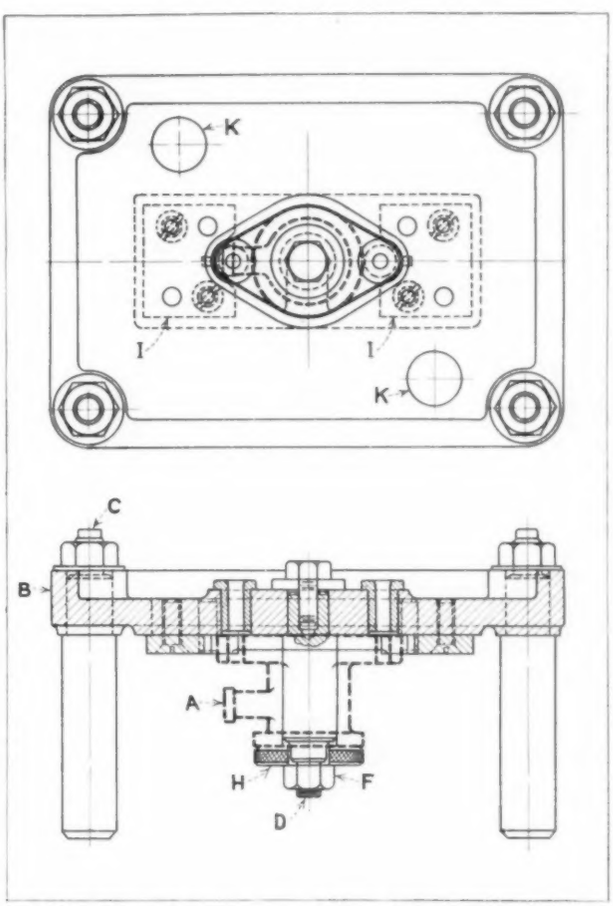
JOHN B. GREEN

The drill jig illustrated was designed for drilling two $\frac{13}{16}$-in. holes in the flange of the work indicated by heavy dotted lines. It will be noticed that a pipe connection *A* is cast on the body of the work directly in line with one of the holes to be drilled, making it necessary to drill the holes from the bottom and to support the bushing plate *B* on four high legs.

In loading the jig, it is turned



Bezels are attached to instrument cases by crimping ten prongs. The crimping levers are operated by a cam controlled by a foot-operated push-type solenoid



Due to a projection in line with one of the holes to be drilled, the work is clamped to the under side of the bushing plate

upside down, resting on the upper ends *C* of the legs. The work is placed on the stud *D* and is clamped to the under side of the bushing plate by tightening the nut *F*. The C-washer *H* makes it unnecessary to remove the nut from the stud in placing and removing the work. The work is located on the bushing plate by the ends of its diamond-shaped flange entering notches in the locating plates *I*. The C-washer is then slipped between the nut and the work and the nut is tightened. The jig is now turned right side up, resting on its legs, and everything is ready for the drilling to proceed.

In unloading the jig, the sequence of the loading operations is reversed. The bushing plate is in the form of a shallow pan and two holes *K* are drilled in it for the escape of the coolant and the chips.

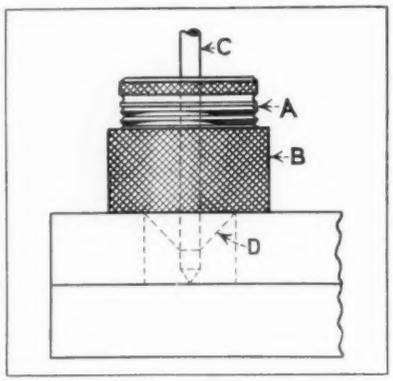
Block for Angular Drilling

F. DOUGHTY
Shipley, Yorkshire, England

A block for use in the drill press is shown in the illustration. It is in the form of an angle plate and is machined all over except the top *A* of the base. Two V-grooves are cut in the face of the vertical member at angles of 30 and 45 deg. from the base, respectively. A V-groove is also cut in the top of the vertical member, increasing the usefulness of the device. The upper corners of the vertical member are cut off at angles normal to the angles of the V-grooves so that work mounted on a mandrel clamped in either of the V-grooves will be properly supported for drilling at an angle.

Two hook bolts *B* are provided for clamping work in the V-grooves, or for holding a mandrel on which work is mounted. The hook bolts can be swiveled so that they will clamp work in either of the V-grooves or clamp work in two places in one groove.

Typical uses for the block are drilling pulley hubs for setscrews, oil holes in bushings; and many jobs where a block should be used for drilling at accurate angles.



With this tool used as described, holes can be transferred from one piece to another quickly and accurately

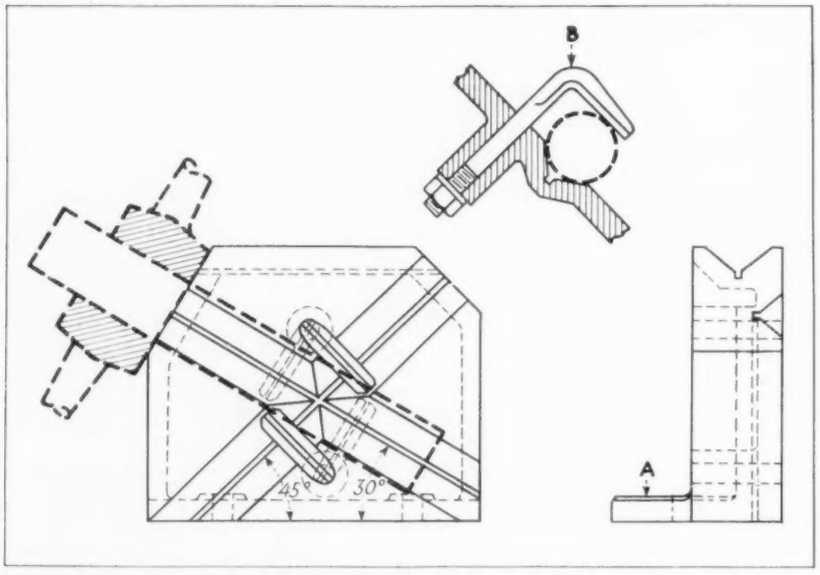
Tool for Transferring Holes

THEODORE KRUGER

In transferring holes from one piece to another, as from a die to a punch holder, it is common practice to clamp the two pieces together in proper relation to one another and to scribe the outlines of the holes with a scriber. The centers of the circles thus scribed are then found with dividers and are center punched for the drill. Sometimes the outlines of the holes are poorly scribed so that it is difficult to find the centers.

The device illustrated was designed to overcome such difficulties. It consists of the threaded and pointed body *A*; the internally threaded ring *B*; and the center punch *C*. The point *D* on the body has a 90-deg. included angle and the body is drilled and reamed for a close fit for the center punch. Both the body and the ring are knurled for a finger grip and all parts are hardened and ground.

In use, the piece from which the holes are to be transferred is clamped to the work in proper location and the angular point of the body is entered into one of the holes as far as it will go. The ring is then screwed down into contact with the piece containing the holes to be transferred, care being taken that there is no rock to the tool. Striking the center punch a light blow with a hammer marks the center of the hole to be drilled in the work. If desired, a circle can be struck from the center punch-mark with dividers.

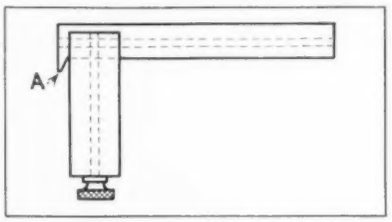


Two V-grooves in the face of the vertical member provide means for holding work to be drilled at angles of 30 or 45 deg.

Scribing Blade for the Diemaker's Square

THEODORE KRAUSE

The diemaker's square illustrated has a scribing point at *A* as an integral part of the blade. The blade is



Equipped with a blade having a scribing point, this diemaker's square is used in the same manner that patternmakers use an adjustable scratch gage

made from $\frac{1}{16}$ x $\frac{1}{2}$ x 3-in. gage stock and has a groove for the head of the holding screw, similar to that in the blade that comes with the square when it is purchased. The point is ground at an angle of 30 deg. and when it gets dull it is sharpened by grinding the angular side.

I have found my square equipped with the scribing blade to be very useful on various jobs of laying out and checking. It has been a time-saver for me.

NEWS OF THE INDUSTRY

Labor Wars Are Deferred While Top Union Leaders Mix in Politics

C.I.O. enrolls W.P.A. workers without dues and expects aid in picketing; also is "craftizing" technical workers

FRANK RISING
Labor Editor, American Machinist

NEW YORK—The "pause that depresses" was universal on the labor front this week, with scant indication of any change either for better or worse. Business observers looking ahead were chary of prediction, but fair estimate of probable developments includes the following:

1. The pursuit of partisan politics will engage most of the attention of top labor leaders for the next few months, and factory organizing plans will be allowed to continue to gather dust on the shelf. Adverse results of employee elections into which the unions have ventured during the past six weeks have confirmed the labor leaders in their belief that new converts are too hard to get right now.

2. A majority of the American Federation of Labor's executive council members still believe that the depression will hurt the Committee for Industrial Organization much more than it will the older craft unions, and consequently the council will meet with C.I.O. for peace talks only if pushed into it by public opinion.

3. The C.I.O. has revised its estimate of the duration of the business slump (consensus formerly was that an upturn would begin in mid-May, now the union economists are talking about November). In line with the long-pull idea, C.I.O. is moving vigorously to extend its power in two new directions—with W.P.A. and with white-collar technical employees in manufacture.

Along with these major trends, the unions are wrestling with day-to-day embarrassments of falling dues, badly-trained and obstreperous local leadership, and a growing public sentiment which seems to feel that the labor organizations pushed their cause too hard and too fast last year and should be quiet for awhile.

These problems do not seriously affect the older unions, either in A.F.L. or in C.I.O., but careful handling of them is vital to the future welfare of the "new era" labor groups. C.I.O., particularly, is doing all it can to lend experience to the United Automobile Workers, United Rubber Workers, United Electrical & Radio Workers, and the National Maritime Union. The other big new unions, Textile Workers Organizing Committee and Steel Workers Organizing Committee, are more adequately staffed with old heads.

In the various branches of metalworking, the situation is gloomy whether you look at it from the union's side or the industrial relations manager's side. Bitter conflict between opposing philosophies—one clinging to "share the work" and the other adhering to close cost figuring and fighting to keep system and efficiency in vogue, is found nearly everywhere. In the opinion of neutral observers, a better long-term method of taking care of unemployment must be developed both locally and nationally before the people vs. machines conflict can be solved.

C.I.O.'s "craftizing" will bear

LATE *NEWS* WIRES

WASHINGTON—Congress "craw-fished" on the vital question of regional wage differentials in the Wage-Hour Bill and created an Administrator who, with several hundred "Industry Boards," will have to sweat out the final decision. "Classifications" for wage rate fixing can mean anything the Administrator says it means. But he reports to Congress, and Southern delegates know that under the law they can demand preservation of the South's "natural advantages" for some time to come. The North gains the privilege of applying the 40-cent minimum at once.

BOSTON—United States Navy has awarded contracts to General Motors and Fairbanks Morse totaling $5,463,801 for propulsion machinery with General Electric equipment for six submarines, five of which are to be built in New England.

PEORIA—Caterpillar Tractor is still operating on a four-day week with orders holding up well during early June. Le Tourneau is running steadily. Whatever layoffs might have been necessary have been absorbed by manufacture of steel houses for its own employees. Altorfer Brothers are active again following settlement of a prolonged strike.

WASHINGTON—The Government arsenal at Watervliet, N. Y., will increase its manufacturing activities in connection with the armament program. The Navy will begin soon part of the three million dollar construction work in the Norfolk district which includes a fuel supply at Craney Island and $685,000 for enlarged ways at the Navy yards.

NEW YORK—British Government is reported to have placed orders for 400 planes in this country. The business has been divided evenly between Lockheed and North American. Curtiss-Wright is said to be starting work on an order for 100 planes for the French Government. Despite the large amount of foreign business placed here, aviation companies are expected to go slow in spending much money for further tooling.

watching. Having found that there is a line beyond which mass-union appeals do not go, the industrial unions are building affiliated branches in the higher-educated, better-skilled classes of employees. The Federation of Architects, Engineers, Chemists and Technicians, working through the Society of Designing Engineers, is going along well, with a contract at Briggs and others on the fire. In other lines, incidentally, C.I.O. is doing the same thing—with insurance men, bank clerks, newspaper workers, federal and state employees, and sundry groups for clerks and office workers.

Meanwhile, in a movement unparalleled in union history, the unions are gathering up hundreds of members among WPA and other relief classes. These unionists get paid-up dues cards without paying anything for them, usually. They aren't allowed to vote in matters affecting the locals, but they are all set for an active part whenever a job opens, any place.

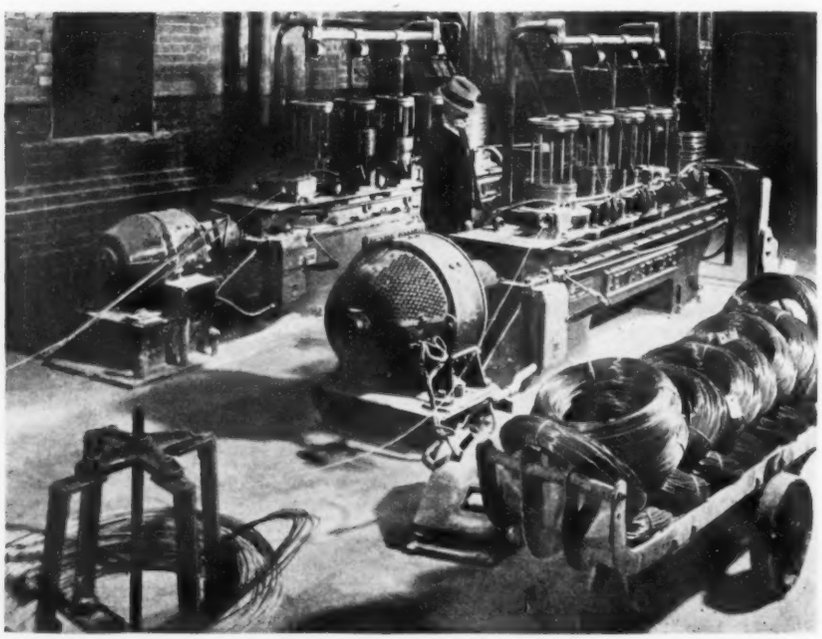
Spreading out in this way, both up and down from the central core of factory unions, the C.I.O. has become potentially a much more important organization than it was even during the hectic crusading days of a year ago. The Committee's strategy board, led by John Lewis, Sidney Hillman and Philip Murray, plan to set up a fullfledged labor federation in the fall—*if* the A.F.L. holds out for continued war. It is undoubtedly true, however, that the C.I.O. would much rather become an autonomous industrial-union department of the federation, and that its leaders hope the peace moves will get somewhere.

Although the A.F.L. hasn't urged its legions on in the way C.I.O. has done, both plan for big organization drives as soon as business sticks its head up and starts to climb the production ladder. And that is as definite as anyone can be—even the planners of the drives don't have any idea of when they will give the word. When and if these drives occur, the steel unions will spring at "Little Steel" first, and it is probable that the South will witness the first really coordinated campaign by the textile workers.

Machine Tool Orders Fall 26 Per Cent

CLEVELAND—Not since 1934 have domestic orders for machine tools reached such a low ebb. In comparison with that year, the only saving feature at present is the larger volume of foreign orders.

The total index for May, as reported by the National Machine Tool Builders Association, is 66.7. Domestic orders stand at 34.8 and foreign orders at 31.9. During April the domestic orders were 43.9, foreign orders, 46.4.



Control of temperatures generated in the metal by cold working are important in attaining exceptional physicals and size uniformity of spring wire. For this reason, the new type wire drawing machines installed by Jones & Laughlin Steel Corp. embody the unusual feature of water cooling

W. P. Woodside Nominated By Metals Society

Those chosen to be officers of the American Society for Metals during next year include: For president—William P. Woodside, vice-president of the Climax Molybdenum Co.; for vice-president—James P. Gill, chief metallurgist, Vanadium Alloys Steel Co.; for secretary—William H. Eisenman; for trustees—Donald S. Clark, associate professor of mechanical engineering, California Institute of Technology and Francis B. Foley, superintendent of research, The Midvale Co.

Management Association Elects Officers

NEW YORK—At the annual business meeting of the American Management Association, held June 2 at the Hotel New Yorker, the board of directors announced the following list of officers for the year 1938-1939:

President, Alvin E. Dodd; chairman of the executive committee, Thomas R. Jones, president, American Type Founders, Inc.; chairman of the finance committee, Harold V. Coes, manager, industrial department, Ford, Bacon & Davis, Inc.; treasurer, James L. Madden, third vice-president, Metropolitan Life Insurance Co.; secretary, Henry J. Howlett.

Divisional vice-presidents include: personnel division, Thomas G. Spates, director of industrial relations, General Foods Corp.; production division, Raymond S. Perry, vice-president, Ingersoll Milling Machine Co.

Among new directors elected for the term ending in 1941 are: D. F. Carpenter, director of manufacturing, Remington Arms Co., Inc.; Earl M. Richards, assistant to the vice-president, in charge of operations, Republic Steel Corp.

Welder Manufacturers Work on Standards

DETROIT—Plans for developing standard transtormer specifications were approved by the Resistance Welder Manufacturers Association at a meeting at the Recess Club, June 9. Walter Anderson, president of the association, and connected with the Taylor-Winfield Corp., requested A. D. Jardine of the Welding Machines Mfg. Co., to present recommendations at the next meeting on July 13. Control makers can enroll as associate members.

Japan Seeks Self-Sufficiency in Automobile Production

Foreign makers are being crowded out, and cheap diesels are sought to use the country's fuel resources

TOKYO—The Japanese are going in for automotive production in a big way. Three years ago output of cars and trucks in Japanese plants was not sufficient to meet one-fifth of the peacetime demand of the Army. By now 70 per cent of all military cars used in China are Japanese built. Under the 1938 program 50,000 cars are expected to roll off the production lines.

This rapid progress is the outcome of persistent government encouragement. There are two laws which embody the Japanese Government's will to make the country a great automotive nation. One, enforced three years ago, curtailed the operations of American branch plants in Japan, placed native automobile firms under a license system and encouraged importation of production tools on a big scale.

The second, to be enforced shortly, seeks to boost domestic production of machine tools by golden promises of tax exemption, cash subsidy and other privileges. Although this law does not apply specifically to automotive manufacturing tools, it is implied that a good deal of the increased production capacity will be diverted to automotive purposes when the current extraordinary ordnance demand subsides.

"Baby" Cars

With the standard passenger and commercial car field in Japan still largely monopolized by American plants (with the exception of the Army and other official demand), the Japanese have concentrated on the production of sub-standard or "baby" chassis for passenger cars and trucks, which are admirably suited to Japanese conditions. Also, a keen interest has been manifest for many years in diesel automobiles.

Japan's demand for an efficient domestic diesel automobile industry arises from the fact that the country depends for more than 90 per cent of its liquid fuel supply on extra-imperial resources. In fact, utilization of all known methods of fuel economization is a matter of national policy.

There are at present four firms which are producing road-vehicle diesels; namely, the Ikegai, Niigata, Mitsubishi and Hitachi companies, while the Kobe Steel Works and the Toyota Automobile Works intend to start production shortly.

Ikegai and Niigata completed their designs almost simultaneously in the spring of 1934. Both are solid injection types, and both employ electric heater plugs for starting. Ikegai builds two sizes, a four and a six of 50 hp. and 70 hp., respectively. The company has been experimenting with a lighter model for speeds up to 3,000 r.p.m. The Nigata diesel is in two sizes, a four developing 50 hp. and a six rated at 65 hp.

Mitsubishi offers three sizes, all of which operate on the prechamber principle. There is a 45 hp. four, a 50 hp. six and a 70 hp. six. In these engines, gas oil or heavy oil of 0.85 to 0.92 specific gravity is normally used, but they may also be run on soya bean oil.

Hitachi's designs are the outcome of comparative analyses of leading foreign makes. The engines are built to take full advantage of the fuel oils available in Japan (cotton seed, fish or shale oil).

The complete chassis of all the above-mentioned makes are priced at $2,500 to $3,000. This is obviously too high an initial cost. In fact, the business chiefly depends on official orders.

In these circumstances the announcement of one of Japan's leading diesel authorities, Dr. Gumpei Asakawa, professor at the Tokyo University of Engineering, that he could produce a diesel engine at less than 2,500 yen ($720) has naturally met with enthusiasm.

The general design of his experimental units seems to be somewhat similar to that of the Model A, four-cylinder Ford gasoline engine. Special and original design is credited to the fuel pump, which, Dr. Asakawa claims, may be produced for less than 100 yen ($29). The dimensions of the four cylinders are 90x120 mm. The economizing feature in the production of this engine is the method by which the crankshaft, the most expensive part in vehicle diesels, is manufactured. Details of the process have not been revealed, but it is understood that a steel casting instead of a forging is employed. The Osaka Chain & Ordnance Co. hopes to sell complete chassis equipped with Dr. Asakawa's engine for 5,000 yen ($1,400).

Another recent development is the Kokueki diesel engine of the Kokueki Automobile Co., one of Japan's numerous builders of midget automobiles and "sanrinsha." Incidentally the new engine, a 20-hp. two-cylinder affair of 726 cc. piston displacement (but a "true" diesel) will be built into these types of vehicles.

Japanese penetration in occupied areas extends only within reach of the military's guns, according to reliable reports. Here a guard keeps a sharp lookout in Manchukuo while ploughing goes forward with a diesel-powered tractor

DETROIT LETTER

Operations will continue through July . . . Parts banks cause concern . . . Important switches in car line-ups are not expected . . . Auto industry isn't worried about Crosley midget car . . . Comparison of production-sales data shows industry's caution

DETROIT—The alacrity with which automobile companies change their plans overnight is an old story to Detroiters. Usually plants don't know from one week to the next what their operations are going to be ten days ahead. Now a change has occurred in schedules for the remainder of the model year. Originally it was planned that automobile makers should turn out before the end of June all the cars that would be needed until 1939 models come on the market and then shut down for two or three months. That plan has been knocked in the head and factories expect to continue operations, probably on a constantly dwindling basis, until well into July.

Longer Shutdowns

If there is any retail business to support such action, a few companies even anticipate building current models into August. Shutdowns will be for about six or seven weeks, compared with an average of four weeks in 1936 and 1937. The situation in the past two years, however, has been abnormally good and cannot be taken as a fair criterion. Prior to 1936 it was the general rule in the industry to take around six weeks to tool up for new model production. What the industry is to do this summer is to revert to that policy, except that the plant closings will be in the third instead of the fourth quarter. For 1940 models, car makers still are agreed that they should go back to January announcements, which is what dealers have been yelling for.

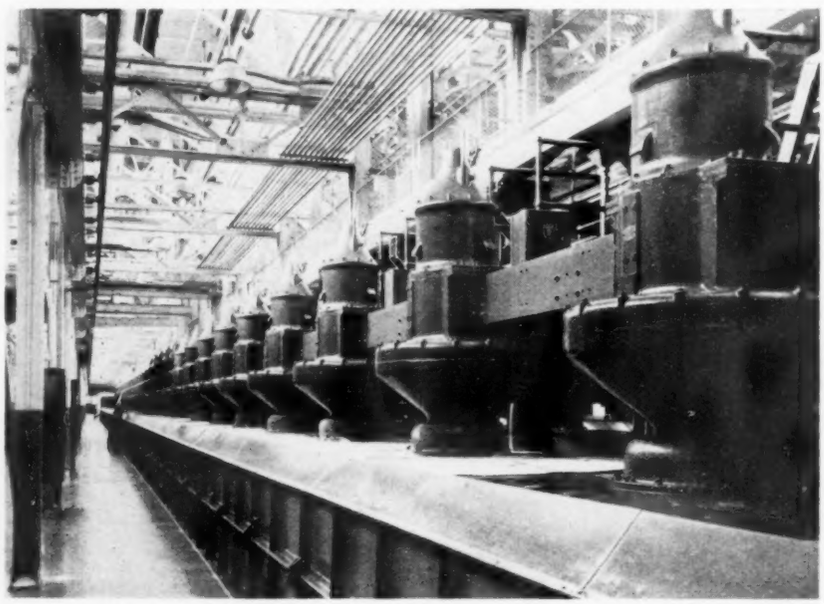
Caution has been the rule this year and will continue the rule during the remainder of 1938. There will be no flooding of the market in the late Fall with new models, though output is bound to spurt during the period when factories will be stocking dealers. What is worrying many car companies at the moment is whether they will be able to use up all the parts and sub-assemblies for 1938 models which are in storage. Though operations since Jan. 1 have been on a frugal scale, nevertheless the accumulation of parts still is bringing chills to production executives.

At this writing there doesn't seem to be much chance of important switches in car line-ups for 1939. Until recently it had been the intention of General Motors to drop the Pontiac and Oldsmobile eights and have those two divisions concentrate entirely on sixes. It is reported that this decision was reached after strenuous protests on the part of both divisions. The move would have aided Buick, which doesn't need any help in holding its strong position in the industry. Anyway, the G.M. brass hats have reversed their ruling and both Pontiac and Oldsmobile are to retain eights. There is an advantage in this for dealers, who can pick up a certain amount of business, though small, which otherwise they would not get.

The talk persists about small cars being introduced for 1939 at $350, but no real facts exist to bear out such statements. The latest sensational rumor widely broadcast is that Powel Crosley, Jr., of radio fame intends to try to "crash" the automotive market with a baby car to be made at Crosley's Richmond, Ind., factory. Officially it can be said that Mr. Crosley has had the idea of low cost transportation off and on since 1912 and he has experimented with more than one gasoline-powered vehicle. But it is believed that any plans for putting out a "jitter-bug," as some people have dubbed it, are being held in abeyance.

Formidable Obstacles

Even if Mr. Crosley should enter the industry, he will be up against some formidable obstacles. One is that the American people have been educated to the luxury of a full-sized car and anything that smacks of being a "half-pint" doesn't interest them. That was proved in the case of Bantam. Another obstacle is the fact that no car maker, no matter how good his product, can succeed unless he can secure a sizable number of efficient dealers. And it is believed that automobiles cannot be successfully sold through radio dealers; the car companies which go through thick and thin, like Buick, have an experienced



***Prodigious*—Four machines two city blocks long, yet constructed to conform to the earth's curvature in their 600-ft. lengths, grind and polish Ford and Lincoln safety glass. There are 30 grinding heads in each of two grinding lines and 50 polishers in each of two polishing lines**

dealer organization which has been at the job of selling cars for many years. For these two reasons alone automobile executives are not losing sleep over any possible competition from Mr. Crosley.

There should be an attempt in the '39 season to reduce prices. There is a strong chance that some companies will follow the lead of Plymouth and cut down the price by adding a line which is essentially the same car stripped of some of its luxuries. The Plymouth Roadking, which has all of the essential features of other Plymouths minus luxury appointments, has been selling well.

Examination of car production and sales figures for the first four months of 1938 shows how wary the industry has been about building cars. Retail car sales in the United States, at 766,173 units, were 67,364 units ahead of the output for the domestic market. That would seem to put dealers in a good spot, but it doesn't look so rosy when one goes back to the fourth quarter of 1937 and finds that production exceeded sales by 383,705 units. On behalf of General Motors it should be said that it has stayed "close to shore" for the last 8 months. From Oct. 1 to May 31 its assemblies ran only 8,504 units ahead of retail sales.

Three-Fold Increase In German Output

The production of German machinery manufacturers is at present nearly three times larger than it was in 1933. According to official estimates, the value of German machine production has increased from 1,546,600,000 Reichsmarks in 1933 to about 4,500,000,000 Reichsmarks in 1937. At the same time the number of workmen increased from 250,000 in 1933 to over 700,000 in the beginning of 1938.

In 1933 about two-thirds of the total German production of machinery was sold domestically and slightly more than one-third was exported. In 1937 this ratio changed slightly less than 18 percent for exports and the remaining 82 percent for the domestic market. While from 1933 to 1937 domestic sales of alll kinds of machinery have increased from 1,011,900,000 Reichsmarks to about RM 3,700,000,000, or by 266 percent, exports increased only from RM 534,700,000 to about RM 800,000,000, or by about 50 percent.

Radio Manufacturers Elect A. S. Wells

CHICAGO—Albert S. Wells, president, Wells-Gardiner & Co., Chicago, was elected president of the Radio Manufacturers' Association at its annual meeting held here during the week of June 5. He succeeds Leslie F. Muter, The Muter Co., Chicago, who becomes treasurer. Newly elected directors include Harry G. Sparks, vice-president, Sparks, Withington Co., Jackson, Mich.; Octave Blake, president, Cornell-Dubilier Electric Corp., Plainfield, N. J.; James C. Daley, vice-president, Jefferson Electric Co., Bellwood, Ill.; J. McWilliams Stone, president, Operadio Mfg. Co., St. Charles, Ill. Bond Geddes, Washington, D. C., was re-elected executive vice-president.

Railroad Employees Must Take a Wage Cut

WASHINGTON—Failure of Congress to do anything fundamental for the railroads makes wage reductions more certain and means that some of the roads will go through the wringer promptly, say Washington traffic experts.

Wage reduction does not mean a strike. While there will be talk and bluff it is believed that railroad employees will take the cut without striking. Regret is expressed that the railroad unions that have built up a reputation for intelligence, have not shown a more socially-minded attitude during the crisis in the affairs of the railroads. Had they put themselves behind the recommendations of W. O. Douglas, SEC chairman, the plan would have made more headway. Had there been real leadership among the railway unions, it is said further, they would have been in the fore front of the movement to work out the problem.

Instead they took advantage of the situation to put over a wage increase at a time when it did the maximum of harm and when it operated most mercilessly on the less skilled and younger workers. Had the leadership known how and when to retreat they could have added to their prestige. Now they are going to have to take the wage cut and like it.

Railroad management, it is gathered, sees nothing to be gained in putting off the evil day. If Congress is unwilling to do anything and if railroad labor will not use its great political influence to help, railroad executives think there is no better time than the present to have a show down with the unions and to wipe out that part of the capital burden that has become unbearable.

All of this has a bearing on business as a whole as it means that railroad buying will be held at a minimum.

Machinery-Metals Exports Reach Lower Levels

NEW YORK—Export orders of machine tools are dropping off, small tool inquiries are almost non-existent, and steel sales are feeling the effects of renewed foreign competition, as well as slackening world trade.

Most disappointing factor is the way Japanese business has blown up. Ony a few months ago almost $3,000,000 per month was being placed. Now a quarter of a million appears high to most observers. Millions of dollars worth of orders clutter the desks of New York agents, but Tokyo hasn't turned the green light. Just when the Nippon finance ministry will put up the cash against import permits is highly problematical. Some say a few days, maybe weeks. Others talk of two or three months. But when it breaks, Japanese buying will again be on a large scale, say those who should know.

American used equipment still finds favor abroad. The market is spotty, but sales are being made to South America, South Africa, Japan, England and France. Even some of the smaller stuff is going to China. South America is perhaps the best spot right now. Venezuela has been in the market for rebuilt tools.

Foreign demand for steel products has quieted down. It is difficult to trace the ultimate uses of such material, and suppliers say that they can not tell whether orders have been used for munitions purposes. Nevertheless, observers feel that European countries are catching up on armament programs with the result that mills abroad also need orders.

This situation might be expected to cause unsettlement in the functioning of the steel cartel. Such is not the case, according to American members of the cartel, who appear satisfied with its operation during the last few months.

Sales of structural steel, wire, black sheets and plates to South America continue on a good level, although not at the same rate as last summer when exports were good.

WATCHING WASHINGTON

Southern senators battle hotly for concessions in wage-houur conference . . . Little chance seen for enactment of educational orders . . . Railroad unemployment insurance, says A.A.R., too costly

McGRAW-HILL WASHINGTON BUREAU
(*Paul Wooton, Chief*)

WASHINGTON—After years of controversy the wage-hour bill concludes it is not right that labor should be sold in the open market along with other goods for what it will bring. Sponsors blame the operation of free trade in human services for much suffering and for a standard of living detrimental to social progress and to purchasing power which moves the current of trade.

During the years of contention over this great question, many issues on both sides have seemed quite important. Now, one issue stands out and seems always to have been the major one: the economic difference between the North and the South.

The South says that cheap labor is due to its natural advantages of climate and agrarian makeup. And the South believes it has a right to capitalize this advantage by attracting industry to its lower costs. And that has been the bitter issue.

The South being outnumbered in congress can win against the North only by the defensive, filibuster tactic, and it can win only on a rejection: it cannot win an initiative measure. First, Southern senators said that if a flat wage were forced upon the South and North alike, they would demand that differential in WPA and government contract wages in the South be removed. That started the compromise.

The Southerners further insisted that the 40 cent minimum should not be mandatory in seven years, as suggested in conference. Instead they demanded that the minimum the first year should be 25 cents, the second year 30 cents, and that thereafter wage and hour boards should decide on a minimum up to 40 cents according to each industry's capacity to pay.

Educational Orders

The Educational orders bill was passed by the House June 6. Objections in the Senate prevented the bill from being voted on recently, and there is some doubt what its fate will be there. The War Department is fairly optimistic at this writing. But much depends on whimsy as worried congressmen rush for the exits.

Industrial Loans

Ten industrial loans totaling $700,000 by Reconstruction Finance Corp. during April went to metal-working and allied industries. The smallest was $3,000 to a garage and the largest was for $300,000 to a shipbuilding concern. RFC officials tell *American Machinist* that industrial lending under the Glass amendment is increasing. RFC's policy is to be helpful to industry.

Public Contracts Act

In a rush and a whirl the Senate passed an amendment to the Walsh-Healey public contracts act, setting the $10,000 minimum down to $2,000, above which contractors must observe wage-hour and other standards fixed by the Secretary of Labor. The amendment also covers sub-contractors in amounts of $500 and up. The Walsh-Healey law, especially if the House passes the amendment and the President signs it, could be made to control labor in a vast section of industry.

Shipbuilding Awards

Award of a Maritime Commission contract to the Newport News Shipbuilding & Dry Dock Co. for four standard C2 cargo steamships, at $2,080,000 apiece, brings the government and the big yards closer to an eye-to-eye cost basis. Observers say the builders took to heart Joseph Kennedy's blast against high bids. Congress gagged at the mere whisper of building ships abroad, but the price was just half of the first domestic bids, and builders knew it was a strong lure. Government threat to bolster small yards with loans was a consideration too. So builders trimmed their overhead, and perhaps their profit figures.

R. R. Unemployment Insurance

Senator Wheeler's bill for railroad unemployment insurance has had committee hearings in the House, and testimony is being taken by the Senate Interstate Commerce Committee. The Association of American Railroads tells *American Machinist*: "The proposed bill has none of the fundamentals of the social security act, nor of the acts of the several states. It has no provision for merit rating which would enable individual employers to secure reduction in their tax rates. It provides no fixed ratio between the earnings of a man while employed and the amount of his unemployment benefit. It is liberal in benefits to casual, intermittent, partly employed and seasonal workers. The railroads believe benefits provided in the bill will be greater than can be financed by the proposed tax of three per cent on payrolls of railroad employees." It is not expected the bill can be passed this session, but it will be urged next year.

More Reports

Contractors and sub-contractors would have to provide the Labor Department with monthly reports on employment, wages, and amount spent for materials, under a bill proposed by House Labor Chairman Mary T. Norton. If and when this comes before Congress, harried contractors will rise in wrath. Some companies are now making scores of reports at great expense, to local, state, and federal government.

FEW WANT IT

The drift toward government ownership and operation of the railroads is probably the most amazing situation in economics, politics or labor. Everyone acknowledges that the drift is not only existent, but that nothing seems likely to occur to stop it. On the contrary nearly everyone expects an acceleration rather than a slowing down.

The extraordinary thing about it is that nobody, to speak of, is in favor of it. On the contrary nearly everybody is against it, President Roosevelt most strongly of all.

There is plenty of support for the opinion that perhaps, with government regulation transformed into management, many economies and duplications could be effected. But the spectre of political decisions discounts even this.

Russian Failures May Lead to More Orders

WASHINGTON—Ample indications have reached the Division of Machinery, Bureau of Foreign and Domestic Commerce and other quarters, showing failure of the Russian machinery industry successfully to execute its plan for machine building in 1937. Electric, rubber, and textile industries all report being adversely affected by failure to receive essential machinery. These reports, taken in connection with the admission that the Soviet machinery industry completed its year in an unsatisfactory manner, the plan being only 82.7 per cent fulfilled, gives the complete picture of the Russian machinery situation. It also is being pointed out that a very high percentage of defective or inferior castings was produced by the Russian foundries.

Management Leaders Plan International Congress

NEW YORK—Management's opportunity to reappraise its responsibilities and opportunities and to show that its main purpose is the promotion of the welfare of the people is to be found in the forthcoming Seventh International Management Congress, Lewis H. Brown, President of Johns-Manville Corporation, declared in announcing the organization of a Commerce and Industry Committee to enlist the support of American business men for the world congress.

The Seventh International Management Congress, to be held in Washington, September 19 to 23, is expected to attract representatives from approximately forty different countries, who will confer upon management problems for a period of five days. Previous world congresses have been held in Prague, Brussels, Rome, Paris, Amsterdam and London.

Many Important Topics

At the general sessions, important questions directly relating to the problems of labor, government and business will be presented by outstanding authorities from the countries represented. Among the topics assigned to American speakers and representatives of foreign countries are: "Management's Responsibilities to Society," "The Continuance of Free Enterprise," "Common Ground for Labor and Management," "Labor's Aims and Responsibilities," "Management's Aims and Responsibilities," and "The Public's Concern in Industrial Harmony."

GEORGE D. HARTLEY

J. M. CHAPPLE

ROSS L. LEFFLER

Dealer's Show Draws 10,000 Visitors

BOSTON—Austin-Hastings Co., Inc., held a show of 100 products of seventeen manufacturers at the Boston Garden from June 8-11, and drew 10,000 persons from all parts of the East. Executives visiting the show at the start sent home for staff engineers and designers to attend in groups on the following days. Major factors in the success of the show were the displays of equipment under actual working conditions, and the facilities for close-up study of internal and external operation.

Light, medium and heavy shop equipment, together with welding apparatus and accessories were shown. Sales off the floor in the first two days included a 16x120 in. surface grinder, a 600-ton hydraulic press and a large jig borer.

PERSONALS

GEORGE D. HARTLEY, for many years treasurer, general manager and sales manager of Sleeper & Hartley, Worcester, Mass., has opened an office at 311 Main St., Worcester, where he will engage in general consultation on such problems as: inventions and patents, experimental and developmental work, plant surveys, designing and building machines and equipment, production methods, management and personnel, sales—both domestic and foreign, marketing new processes, inventions and patents. Since retirement from Sleeper & Hartley in 1936, which he organized with the late FRANK H. SLEEPER, Mr. Hartley has spent much time investigating industrial conditions and plants in leading European countries.

J. M. CHAPPLE has been made managing director of the new manufacturing subsidiary, Lincoln Electric Co., (Australia), Pty., Ltd., recently established at Alexandria, (Sydney) Australia, by J. F. LINCOLN, president of the Lincoln Electric Co., Cleveland. Mr. Chapple will be in charge of manufacturing, sales and advertising of the new company. He is a veteran in the welding industry, particularly abroad.

ROSS L. LEFFLER has been made director of industrial relations, of the Carnegie-Illinois Steel Corp., and GEORGE P. WARDLEY has been appointed assistant director of industrial relations. Mr. Lefler formerly was manager of the industrial relations department, Pittsburgh District, and Mr. Wardley was superintendent of industrial relations at the South Chicago Works.

ROBERT H. HEYER, metallurgist in the research laboratories of The American Rolling Mill Co., Middletown, Ohio, will receive the Charles B. Dudley medal of the American Society for Testing Materials because of his paper "Analysis of the Brinell Hardness Test".

F. J. CHRISTIE, formerly assistant general superintendent, has been appointed acting general superintendent of the Vandergrift, Pa., Works of the Carnegie-Illinois Steel Corp. JAMES M. BORTZ has been made assistant to the general superintendent, and E. J. PARSONS is now superintendent of the open hearth and rolling mills.

WALTER K. DOW, who has been plant superintendent of the Alexander Milburn Co., Baltimore, Md., for the past years, has been elected vice-president. Mr. Dow was formerly identified with the DeVilbiss Co., Toledo, for ten years in a manufacturing and supervisory capacity in regard to paint spray equipment.

L. B. HAMPTON has been made manager of the Pacific Northwest district of the Crane Co., Chicago, succeeding F. A. NITCHYA who retired after 46 years service.

A. J. KOETSIER, is now superintendent of the Micarta Division, Westinghouse Electric & Mfg. Co., located at Trafford, Pennsylvania.

A. J. JENNINGS

A. J. JENNINGS has been appointed sales manager of the Cleveland Worm & Gear Co., and of its affiliate, the Farval Corp., manufacturers of centralized systems of lubrication. Mr. Jennings has directed Farval sales for many years. Assisting him will be S. L. EASTMAN, sales representative for Cleveland Worm & Gear for several years, and C. R. BURRELL.

LAURENCE S. HARRISON, assistant to the president of International Business Machine Corp., has resigned. Mr. Harrison, who was formerly director of engineering for I.B.M., has entered private practice in the field of industrial research, specializing in the development of new devices, product design and improvement, research and development policy consultation and engineering department organization. He is also the president and a director of the Technical Research Products Corp., 295 Madison Ave., New York, which has taken over a group of patents and inventions for license to manufacturers.

VICTOR W. KLIESRATH, vice-president and a director, Bendix Aviation Corp., was made head of the company's new marine development division with headquarters in New York. MALCOLM P. FERGUSON was made vice-president and general manager, Bendix Products Corp., while JOHN P. MAHONEY becomes vice-president in charge of industrial relations. HERBERT L. SHARLOCK, vice-president and director of publicity, Bendix Products Corp., was advanced to director of public relations, Bendix Aviation Corp. These changes are in line with the recently outlined decentralization program of the Bendix Aviation Corp.

W. K. EDMUNDS, for eight years in charge of Ford activities in Chicago, has been made manager of the Edgewater, N. J., branch. H. C. DOSS, former manager of the Kansas City branch succeeds Mr. Edmunds at Chicago. C. A. ESSLINGER, for the past six years manager at Edgewater, is now manager at Chester, Pa.

ANDERS G. ERICSON has been made chief engineer of the Homestead Works, Carnegie-Illinois Steel Corp. ARTHUR V. WIEBEL is assistant chief engineer.

RUFUS E. ZIMMERMAN, vice-president of research and technology, United States Steel Corp., received the degree of Doctor of Science from Franklin & Marshall College in Lancaster, Pa., on June 1.

HENRY J. MOKATE has been made manager of sales of the new secondary products division, Carnegie-Illinois Steel Co.

R. B. SCHENCK, Buick chief metallurgist, was elected chairman of the Saginaw Valley Group, American Society of Metals, at the annual meeting in Saginaw. C. M. CAMPBELL, division metallurgist, Chevrolet Transmission Division, was elected secretary and treasurer.

JOSEPH H. CARTER has been elected a director and vice-president in charge of operations, Pittsburgh Steel Co.

DAVID T. MARVEL has been appointed manager of tube sales by the Timken Roller Bearing Co., and will maintain headquarters at Canton, Ohio.

GEORGE H. BATES is general manager of the New York Plant of the Bethlehem Shipbuilding Corp. Ltd., set up upon acquisition of the various construction and repair facilities of the United Shipyards, Inc., by Bethlehem. The individual plants have been designated as the Staten Island Works, with CHARLES H. BOYLAN as manager; the Brooklyn Fifty-sixth Street Works with JOHN T. WISEMAN, manager; the Brooklyn Twenty-seventh Street Works under WALTER CRANE, and the Hoboken Works with GEORGE BROWN in charge.

BUSINESS ITEMS

Tungsten Carbide Tool Co. (division of Michigan Tool Co.), Midwest Tool & Manufacturing Co., and the Morse Tool Co., all of Detroit, have signed dealer contracts with Vascoloy-Ramet Corp., North Chicago, Ill.

WESTCOTT CHUCK Co., Oneida, N. Y., has appointed FRED D. BAKER, Lakewood, Ohio, as factory representative in northern and central Ohio. He will supervise sales and work in conjunction with Westcott distributors in that territory.

GEORGE P. HOWELL has been appointed district manager for Wisconsin and Upper Michigan for the Steel Division, Acme Steel Co., Chicago. He is a former director of the National Association of Purchasing Agents.

The Stearns Magnetic Mfg. Co., Milwaukee, manufacturers of magnetic separators and magnetic friction devices, has announced the appointment of the DeLavan Engineering Co., as sales representative in Des Moines, Iowa.

Ware Bros., manufacturers of screw machine parts and the Chicago Roller Skate Co., both occupying a one-story plant at 4450–8 W. Lake St., are taking bids on three-story addition to cost approximately $200,000.

Logan Engineering Co., makers of automatic safety mining equipment, has begun construction of a new factory building at Lawrence & Lamon Ave., Chicago.

Carl Zeiss, Inc., 485 Fifth Ave., New York, N. Y., will furnish full details on a "Jena Fall Course" to be held this year during the last week of September at the Zeiss Works, Jena, Germany. The lectures will cover spectrographic analysis; the design, manufacture and use of precision measuring instruments; microscopy; metallography, and precision methods of gaging and their importance. No charge will be made for the lectures.

The Wickwire-Spencer Steel Co. is planning to erect a $500,000 building at Buffalo, N. Y., to be used as a wire mill along with its present plant, and has asked bids on the building, which is to be erected as rapidly as possible.

A stock of high nickel content alloys in various shapes and sizes, particularly Nichrome and Nichrome V, is now available for immediate delivery to the Pacific Coast trade, according to the Driver-Harris Co. The warehouse is located at 316 Eleventh St., San Francisco, and the representative is the Electrical Specialty Co.

OBITUARIES

ARTHUR P. VAN SCHAICK, vice-president, American Chain & Cable Co. died June 8. Mr. Van Schaick who was 56 years old had been in ill health for the last year. He was a former president of the American Hardware Manufacturers' Association.

J. F. VOGEL, for the past twenty years president, Gendron Wheel Co., Toledo, died May 20 at the age of 80. The Gendron Wheel Co. merged with the American National Co. last year.

LOUIS E. CURTIS, 74, inventor of the Curtis metal lathe and for many years a consulting engineer in Chicago, died June 1.

ALEXANDER R. GRANT, president, Moore Corp., stove manufacturers, Joliet, Ill., died last week at the age of 39.

A. J. OAKS, 70, senior partner and general manager of the South Fork Foundry & Machine Co., South Fork, Pa., died June 4.

ALBERT B. WEISSENBORN, 74, president and general manager, Appleton Wire Works, died June 2. He was one of three men who organized the plant in 1896.

GEORGE E. ROEHM, 73, formerly secretary of the Hupp Motor Car Co., and chairman of the board of the Motors Metal Mfg. Co., Detroit, died May 29.

MEETINGS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer convention, June 20-24, Washington, D. C. H. H. HENLINE, national secretary, 33 West 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 27-July 1. Chalfonte-Haddon Hall, Atlantic City, N. J.

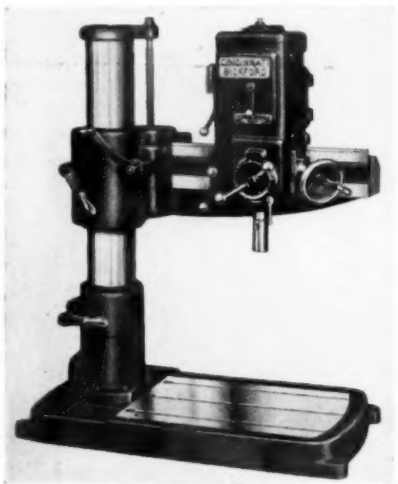
SHOP EQUIPMENT NEWS

Cincinnati Bickford High-Speed "Super-Service" 2½-In. Radial Drill

Developed especially for work which includes much small drilling and tapping in fairly large parts, this 2½-in., 7½-in. column high-speed "Super-Service" radial drill announced by the Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio, provides three changes of spindle speed. With a 1,200 r.p.m. driving motor, the speeds can be any one of several optional ranges. Replacement of two pick-off gears permit changing speeds to other specified ranges at any time. Six spindle speeds can be obtained by using a two-speed a.c. motor instead of the constant speed type.

Three rates of power feed of 0.003, 0.006 and 0.009 in. per rev. of the spindle are selected by setting the indicator lever at the center of the head. The all-geared feed change unit is anti-friction bearing mounted, automatically oiled and makes use of integral key multiple splined shafts. Power feed is engaged by quick-return levers directly above the spindle.

Arm and column are clamped by levers at the left of the column. Arm elevation is manually operated, since this size and type of radial drill seldom requires a change of arm height. Head is fully inclosed and contains a constant-speed rotary pump which circulates the oil to every moving part. Spindle and sleeve are counterweighted and the feed rack is an integral part of the spindle sleeve.

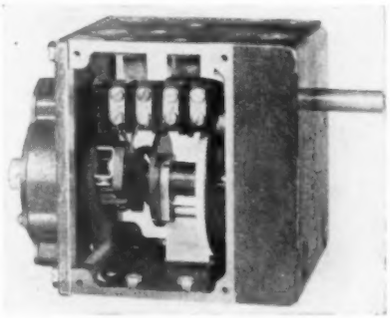


Hisey Wolf Heavy-Duty Wet and Dry Grinders

Splash bowls on these heavy-duty wet grinders are arranged to catch all water, yet permit freedom of operation in grinding long or odd-shaped work. Offered by the Hisey-Wolf Machine Co., Cincinnati, O., these machines are self-contained with a built-in pump and large water reservoir. Single-wheel units, as shown, are furnished for 16, 18, 20 and 24-in. wheels. Smaller double-wheel wet units and combination wet and dry grinders for 10, 12 and 14-in. wheels also are available.

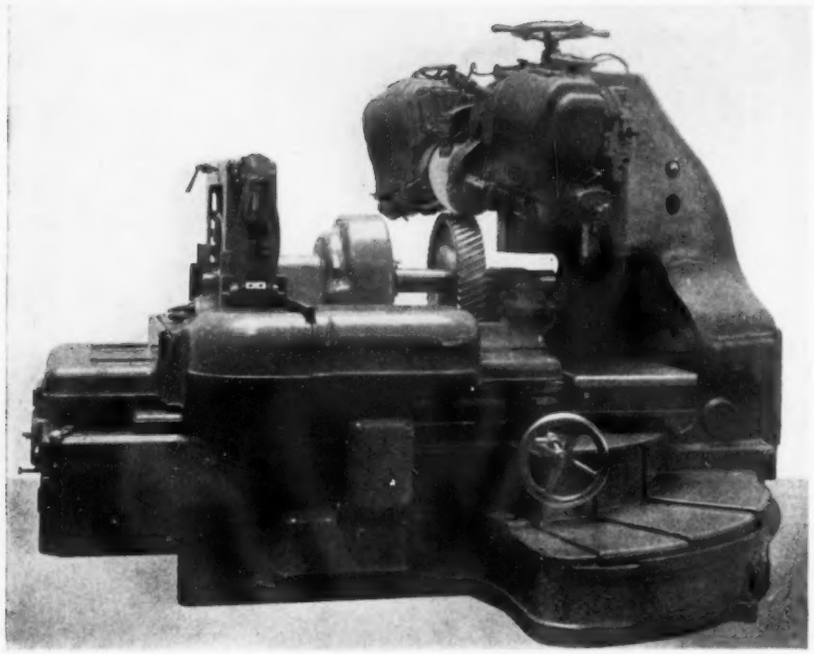
G. E. Measuring Feed Limit Switch

While designed primarily as a means for obtaining definite, predetermined amounts of feed in planer operations, the No. CR-9441-A1A feed-measuring limit switch announced by General Electric Co., Schenectady, N. Y., also is suitable for intermittent operation of the feed motor on plate planers, roll grinders and other machines. It will control an intermittent feed or index function which must be adjustable and consistent in operation. Essentially, the switch consists of a drive shaft connected to the feed mechanism; an indexing means for setting the amount of feed to be obtained at each individual operation; and a resetting mechanism for bringing the switch automatically to the zero position after each individual operation has been completed. Drive shaft operates the switch through a magnetic clutch. Indexing mechanism also includes an arrangement for locking it positively in any selected position. Switch is 4⅞ in. wide, 5 13/16 in. high, and 6 3/16 in. deep.



Maag Gear Grinders

Having capacities ranging from 12 to 144 in. maximum gear diameter, the helical and spur gear grinding machines developed by Maag Gear-Wheel Co., Ltd., Zurich, Switzerland, employ two saucer-shaped wheels for the grinding process. The outer edges of these wheels are the only surfaces that touch the flanks of the teeth. When rotating, these edges form a circle and the two planes containing these circles may be considered as the flanks of a corresponding rack tooth on which the gear blank is rolling during the grinding process. An automatic device for compensating for wear of the grinding wheels is said to insure accurate positioning of both grinding planes with regard to the blank. Offerred in the United States by Trip-



lex Machine Tool Corp., 125 Barclay St., New York, N. Y., these machines grind the right and left flanks of the gear teeth simultaneously, thus avoiding errors caused by removing and remounting the gears. Automatic wear compensating device operates with a precision of 0.0004 in.

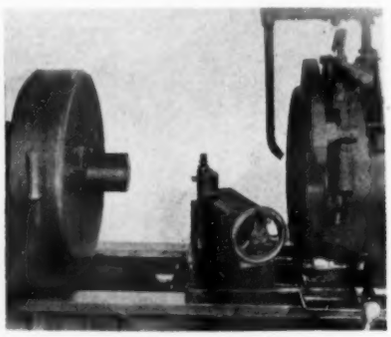
The tooth flanks are produced by a generating motion in the rack tooth, represented by the two working planes of the grinding wheels, and the grinding wheels touch the flanks only in two points of a generating line. Dividing operation is performed in two motions; the first being by means of change gears and the second, giving the exact division, is obtained by means of accurately worked dividing plate in combination with a dividing bolt which is placed in one of the tooth gaps, fixing the exact position of the plate. Generating slide is driven by the main shaft and a cam plate. This slide carries the generating spindle and supports on its outer end the pitch block which is connected by four steel bands to the pitch block stand mounted on the feed slide. By this arrangement the straight alternating motion of the generating slide is converted into a swinging generating motion at the gear blank. During the feed motion, the pitch block stand remains stationary when grinding spur gears. For grinding helical gears, however, a small cross-motion is imparted at each feed stroke by a slot guide corresponding to the helix angle of the gear to be ground.

Grinding wheel spindles are mounted individually on turn plates on a transverse support which can be moved vertically for different sizes of gears. These turnplates are moved horizontally according to the pitch of the gear to be ground and turned to correspond to the required angle between the grinding wheels. Wear compensating devices also are mounted on the transverse support. The type HSS-60 grinder shown has capacity for spur and helical gears up to 24 in. in diameter.

Landis Beveling Tool

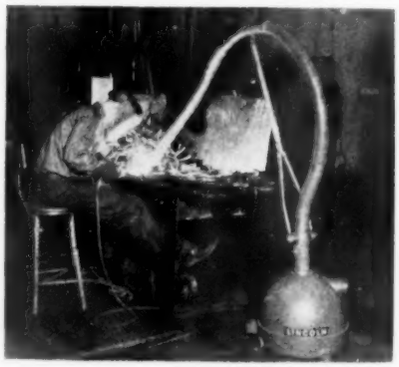
Construction of the line of pipe threading and cutting off machines equipped with a beveling unit recently has been modified by the Landis Machine Co., Waynesboro, Pa. The improved beveling unit is placed on the carriage immediately in front of the threading head. With the new arrangement, the pipe end overhangs the chuck jaws a relatively short distance, permitting an accurate, smoothly finished bevel to be formed at all times.

Beveling unit is pivoted on a base which has been cast integral with the forward projection of the die head carriage. This base has a graduated scale to show the inclination of the tool assembly with respect to the center line of the pipe. Thrust collars are provided on the feed screw shaft to minimize wear between the shaft and the tool holder slide. After the bevel has been cut, the tool holder slide is retracted.



"Linconditioner" Air Cleaner

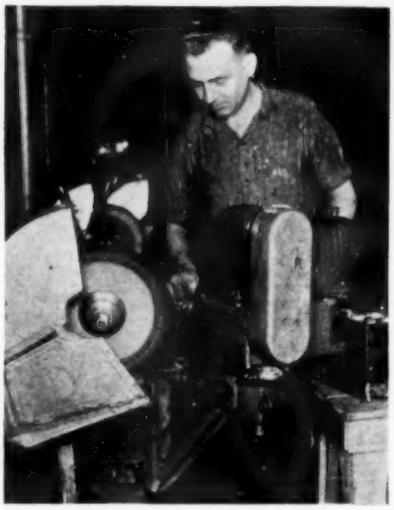
Developed to remove approximately 95 per cent of the dirt from the air in the vicinity of grinding, welding and other shop operations by filtering out the dirt particles, the "Linconditioner" announced by the Lincoln Electric Co., Cleveland, Ohio, also is said to draw smoke and heat away from the work. This unit also can be adapted to blowing smoke away where such operation is desired. Unit consists of a motor driven fan which produces suction through a flexible metal tube. Air is exhausted from the tube into a filter which is located in the periphery of the power



unit. Tube can be supported by an arm and spring arrangement so that the nozzle can be shifted to any spot within the operating radius. Standard tubing is 10 ft. long, permitting operation within a 14 ft. diameter circle.

Shakespeare Automatic Buffing Machine

Designed for mounting on the left side of a standard buffing lathe, the automatic buffing unit developed by Shakespeare Products Co., 417-427 N. Pitcher St., Kalamazoo, Mich., can operate either with expanding or contracting collets to suit the parts being buffed. Six different speeds and feeds can be obtained by adjust-

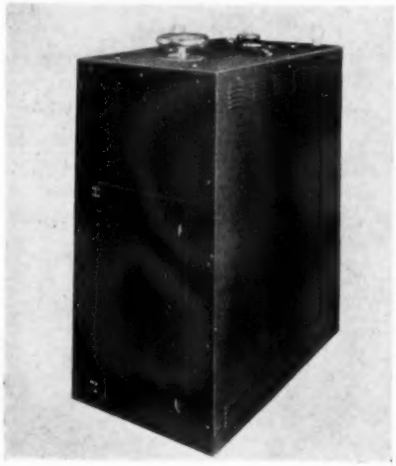


ing a lever and changing the chain drive on the sprocket. As many as 1,440 pieces per hour can be color buffed on a variety of parts.

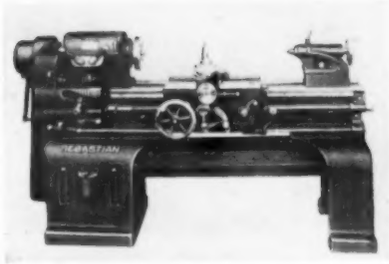
Parts are placed on a work table at the operator's left and he simply places them on the collet, which moves straight into the wheel and out again. Air pressure ejects the buffed part as the collet returns from the wheel. Standard stroke of slide is 1¾ in., and slide support can be adjusted vertically 3 in. on the column. Machine is capable of buffing parts 5 in. in diameter. Net weight of unit is 196 lb.

American "Trans-Arc" Arc Welder

Using condensers in combination with a welding transformer, the "Trans-Arc" arc welder offered by the American Transformer Co., 178 Emmet St., Newark, N. J., features a low open-circuit voltage for greater safety and a relatively high voltage for maintaining the arc. Welding current is controlled by means of a continuously variable auto-transformer regulator which varies the voltage across the condensers. This welder is available in 150, 300 and 500 amp. sizes for operation on 230 or 460 volt, 60 cycle circuits.

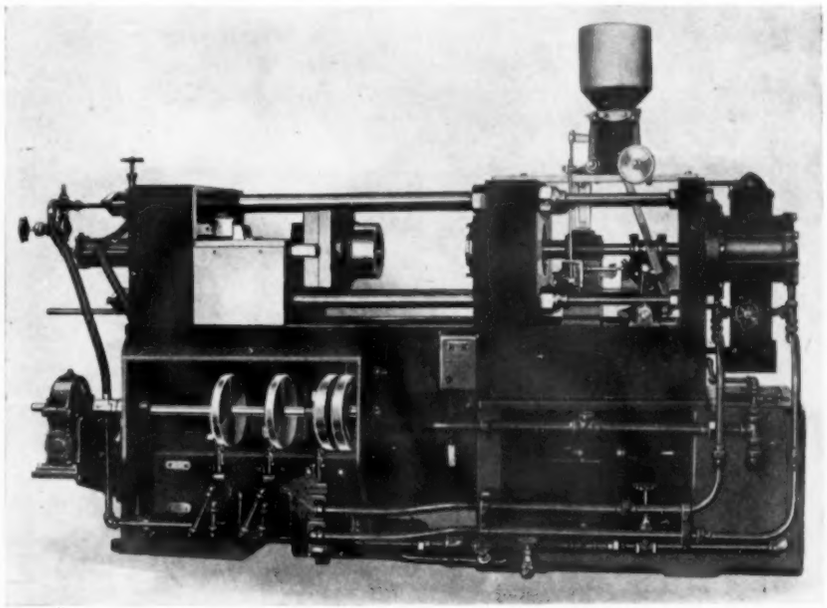


Sebastian Type H "Stremeline" Lathes



An eight-speed geared headstock is used on the Type H "Stremeline" lathes offered by the Sebastian Lathe Co., Cincinnati, Ohio. These lathes are available in 12, 14, 16, 18 and 20 in. sizes in standard bed lengths. Chrome hardened threads and spline on the lead screw and threads on the cross feed screw, as well as a chrome hardened tailstock spindle, are featured in these lathes. Timken bearings are used on all shafts in the headstock, including the spindle. Although arranged for motor drive with the motor mounting in the front legs, these lathes can be supplied for single friction flat pulley drive. Thread range for all sizes of these lathes is from 3 to 384 threads per inch. Optional speed ranges, each with eight steps, are provided for each size of lathe. Gap beds can be furnished for all sizes except the 12 in. model.

Grotelite No. 29 Automatic Plastic Injection Molding Machine



Three cams mounted on a shaft driven by a hydraulic motor control the sequence of operations of the No. 29 automatic plastic injection molding machine, announced by The Grotelite Co. Inc., Bellevue, Ky. A maximum pressure of 63,000 lb. can be employed in injecting the plastic material, the pressure on the material being adjustable up to 30,000 lb. per sq. in. As many as 500 shots per hour, with a maximum of 6.5 oz. per shot, can be cast. Maximum projected area in the die is 45 sq. in. Bolster plates measure 28x22 in. and stroke of main piston is 9½ in. Die opening stroke is adjustable to 8½ in. and die space between bolster plates is adjustable to 24 in.

The first cam on the camshaft opens the first main control valve, admitting fluid pressure to a 4-in. cylinder which closes the mold. When the mold is closed, the second cam actuates another valve which admits hydraulic pressure to a 5-in. cylinder under the machine. This unit pushes a wedge up through a hole in the mold-closing ram, thus locking the ram positively in posi-

tion. When the wedge is in place, the third cam opens the pressure valve, admitting hydraulic pressure to the 9-in. cylinder at the extreme right of the machine. This cylinder pushes material through the heating cylinder into the closed mold.

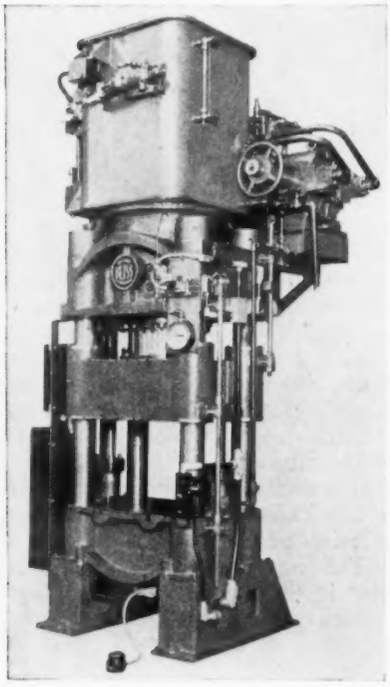
All dwell periods are operated by a pneumatic system controlled by a trip valve on the motion of each ram. Pressure from this air system is transmitted to a brake to stop the hydraulic motor, thus stopping operation of all control cams during the dwell period. Feed mechanism is designed so that each feeding delivers a predetermined weight of material. The 1,000 lb. per sq. in. hydraulic pump on this machine is driven by a 10 hp. motor.

Bliss 350-Ton "Hydro-Dynamic" Single-Action Open-Rod Press

Equipped with an integral pumping system and all electric control, the 350-ton capacity "Hydro-Dynamic" single-action press announced by The E. W. Bliss Co., 53rd St., and Second Ave., Brooklyn, N. Y., is of the open-rod type with a moving down slide. Slide is guided on all four rods by removable bronze bushings. Maximum stroke of press is 12 in., but by adjustment of the press control any desired stroke of less than 12-in. can be obtained in any part of the full stroke travel. Slide has a high-speed approach to the work and changes automatically to the pressing speed just before the work is contacted or, by a simple manipulation of the control, the change of speed can be delayed until after the work is contacted and pressure starts to be exerted. Press will continue its pressing speed until a selected pressure is obtained, after which it reverses automatically and returns to the starting position at high speed. If desired, automatic reversal can be obtained after the slide has traveled a given distance instead of after attaining a given pressure.

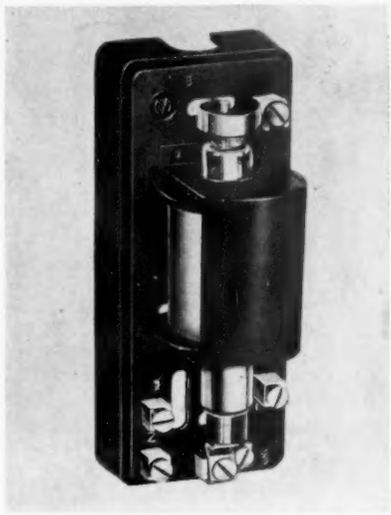
Press is equipped with an oversized prefill valve of the normally-open balanced quick-acting type, making it possible to obtain as high as 40–45 strokes per min. when operating on a short stroke, as in coining and embossing work. When equipped with an automatic feeding device and arranged for continuous operation, a production of 1800 pieces per hour is obtainable.

Control of press is electrical throughout, both for production operation and inching control. Press can be started either by foot-button or hand-button as desired; multiple starting buttons can be provided when required. It is possible to move the press slide at increments as small as $\frac{1}{16}$ to 1 in. when on inching control. Both bed and slide areas are 30 in. square; shut height is 15 in.; overall height is 12 ft. Weight of press is approximately 18,000 lb. A 30 hp., 850 r.p.m. motor is required.



"Vertex" Non-Tilting Mercury Relay

Consisting of a vertical tube surrounded by a solenoid, the "Vertex" relay offered by Dr. F. Loewenberg, 10 E. 40th St., New York, N. Y., contains a cylindrical plunger which floats on a mercury bath. When the solenoid is energized, this plunger is drawn downward magnetically, thereby displacing the mercury which rises and makes contact with the upper electrode. The mercury tube thus remains stationary and the mechanical motion takes place completely within the hermetically sealed tube. No tilting of the tube is required for making and breaking the contact. Normally closed tubes operate by having the plunger displace the mercury by its own weight. In this case,



the magnetic action of the coil lifts the plunger, thus causing the mercury level to fall and break the contact. Tubes are filled with an inert gas to prevent oxidation.

Robbins "Universal" 110-Volt Magna-Sine

Limited to use with 110 volt current, the "Universal" Magna-Sine offered by Omer E. Robbins Co., 635 Mt. Elliott Ave., Detroit, Mich., consists of a base plate to which is hinged the magnetic chuck table. This table may be tilted to any desired angle by employing gage blocks which are placed between the top of the base

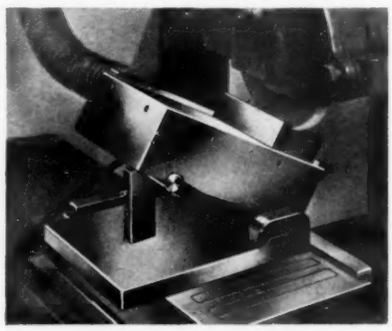


plate and a cylindrical bar which extends the full width of the hinged table on the under side. The distance between centers of the pivot hinge and the gage block contact bar is 5-in. on this universal unit.

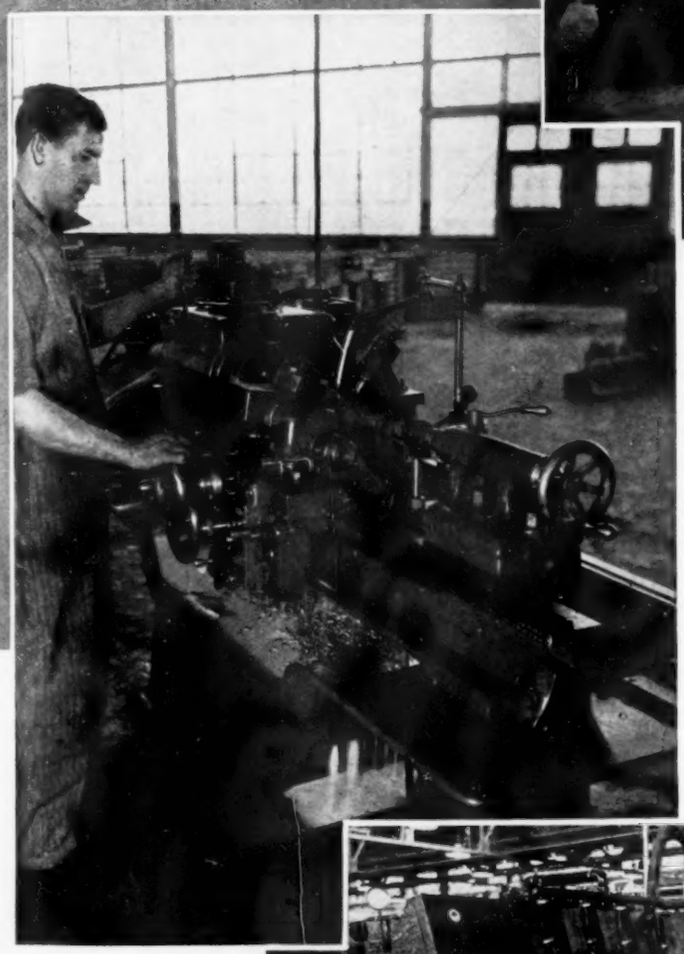
Noyes Carbide-Tool Grinding Fixtures

Fixtures designed for mounting on standard bench grinders are offered by Noyes Tool Sales Co., 601 Laurel Ave., Bridgeport, Conn., for grinding carbide-tipped tools. The rocking

IN TONAWANDA OR TALLAHASSEE MOTOR CARS OR MANDRILS

IT'S COSTS THAT MAKE SALES POSSIBLE THAT COUNT!

Seven Le Blond Lathes in one battery at the Chevrolet Plant, Tonawanda, N. Y. Five 20" x 40"; one 24" x 48" heavy duty; one 20" x 72" . . . all used on general work that must be turned out in the tool room.



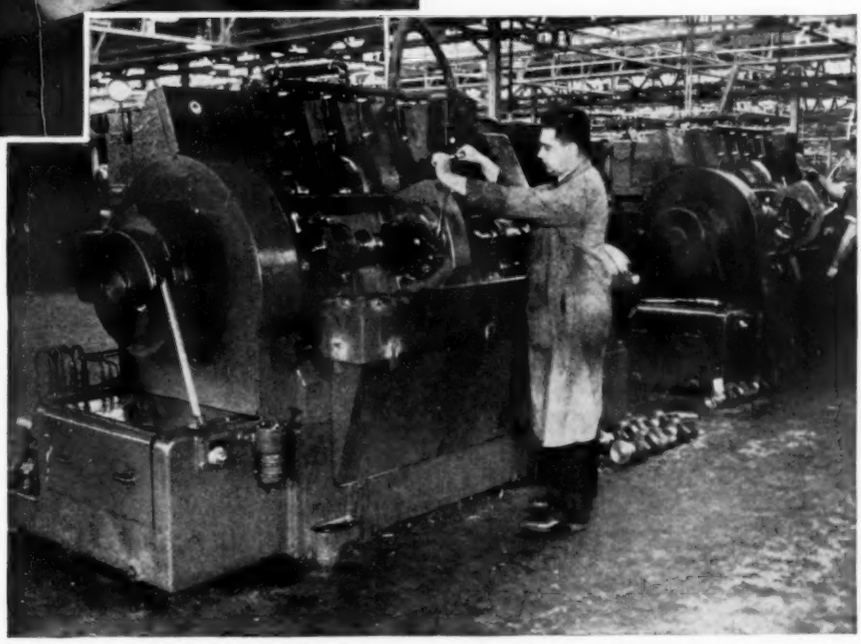
THE location of your plant and what you make are important, but what it costs you to make a product is vital.

Economy—Low Cost—Faster Production all add up to one thing—profitable sales . . . and that means LEBLOND LATHES. Their inbuilt precision, stamina, ease of operation and control enables them to meet the highest production standards and the fastest production schedules with plenty to spare.

Whether you make motor cars or mandrils, monoplanes or mowing machines—these modern machine tools point the way to lower costs that make sales possible. And of course we mean profitable.

THE R. K. LEBLOND MACHINE TOOL CO.
Dept. H-9 **CINCINNATI, OHIO**

A snapshot of a LeBlond 24" engine lathe in the Chevrolet Plant, Tonawanda, N. Y., engaged in rough turning gear diameter on camshaft.

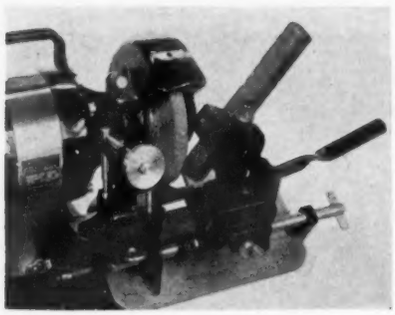


Two Le Blond D. M. Crankshaft Lathes, part of a battery of three of these machines installed in Chevrolet Plant, Tonawanda, N. Y. These lathes are used to check sides of crankarms and counter-weights on crankshafts. Each machine produces 27 pieces per hour.

A SMILE AT EVERY TURN

Have you ever been a victim of the "Houdini" sales approach—the "Gift Bearer" or the "Confidential Deal"? Get your copy of this new book with a chuckle on every page "Seven Times around Jericho". Free on request.

LE BLOND



guide provided in these fixtures rocks the tool across the peripheral edge of the grinding wheel, either in a plane at a slight angle with the wheel face or parallel to it. This angle can be varied.

Tool holding head is adjustable, with graduations in both horizontal and vertical planes. This head is fitted to a table having axial adjustments parallel to the grinding machine shaft and extending beyond each wheel of the double-ended grinder. Either right- or left-hand tools can be ground at each end of the grinder, permitting grinding tip clearance at one wheel and shank clearance at the other.

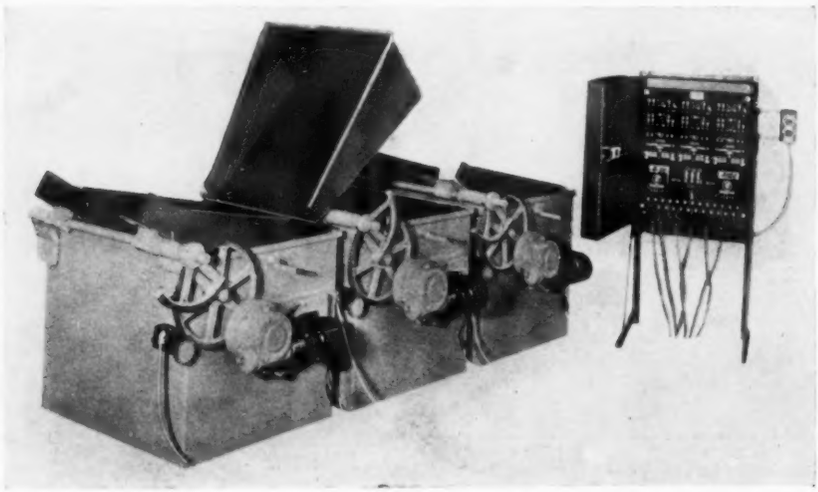
A hand guide for forming round nose tools independently of the guide shaft and for general regrinding is available. This guide is graduated for vertical adjustment and is provided with two bases at right angles, so that the fixture can be turned from one base to the other for grinding both the rake on the top of the tool and the side clearance. A radius fixture that slides on the guide shaft has a range for a maximum radius of ½ in. male or female. This fixture has transverse adjustment to provide for wear of the wheel.

H.-V. W.-M. Hopper-Type Barrel Plating Units

Automatic handling of barrel plating work is said to be commercially practical when using hopper equipment developed by Hanson-Van Winkle-Munning Co., Matawan, N. J. Several different designs of hoppers have been developed for use depending on the size of the articles and the shape of bottom best suited for the operations. Hoppers are made either of plain steel or Monel metal and the tanks are steel or rubber lined with bottom drain outlets and substantial overflow dams. Each hopper load is equivalent to the plating cylinder load, which varies from 50 to 100 lb. Adequate rinsing is said to be assured by proper circulation of the liquid through the overflow dam; however, for work requiring special treatment, a simple reciprocating device is added which moves the hopper continuously through a vertical stroke of 6 in.

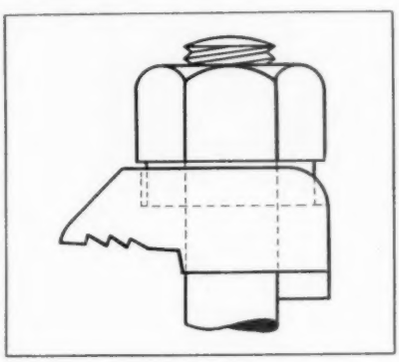
Work proceeds from one hopper to the next through the necessary sequence of cleaning, rinsing, acid dipping, etc., then to the empty plating barrel cylinder. After being plated, the work goes again from one hopper to another through other rinsing and drying operations.

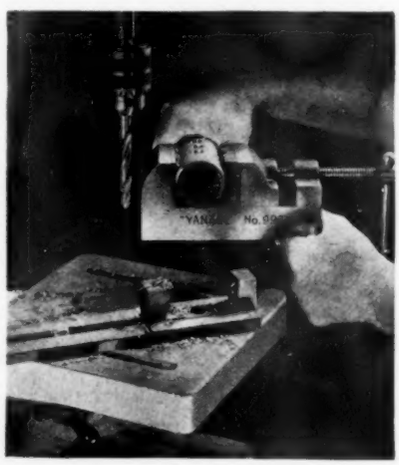
Where loads are heavy and the rate of production high, automatic lifting and lowering of loads is provided. Each tank has an individual motor drive and limit switch, thus permitting the addition of as many hopper units as required, depending upon the number of treatments involved. The entire assembly is controlled automatically from a master panelboard. This control board is equipped with dials to give variation of dwell of the hopper load in the solution ranging from 20 sec. to 4 min. per tank.



Fanner "Safety" Hook Bolt Head and Washer

A combination safety hook bolt head and deep washer to convert ordinary bolts into hook bolts is offered by The Fanner Mfg. Co., Brookside Park, Cleveland, Ohio. These bolt heads are claimed to be stronger than a forged hook bolt. Undercuts prevent the heads from turning when used with girders and other rolled steel sections. When used with bolt heads, the hook bolt unit is used alone, but when used at the other end of a bolt, a deep washer is used to permit the nut to turn. Beams may be secured at right angles by using two hook bolt heads at each corner of the assembly.





"Yankee" Machine Vise

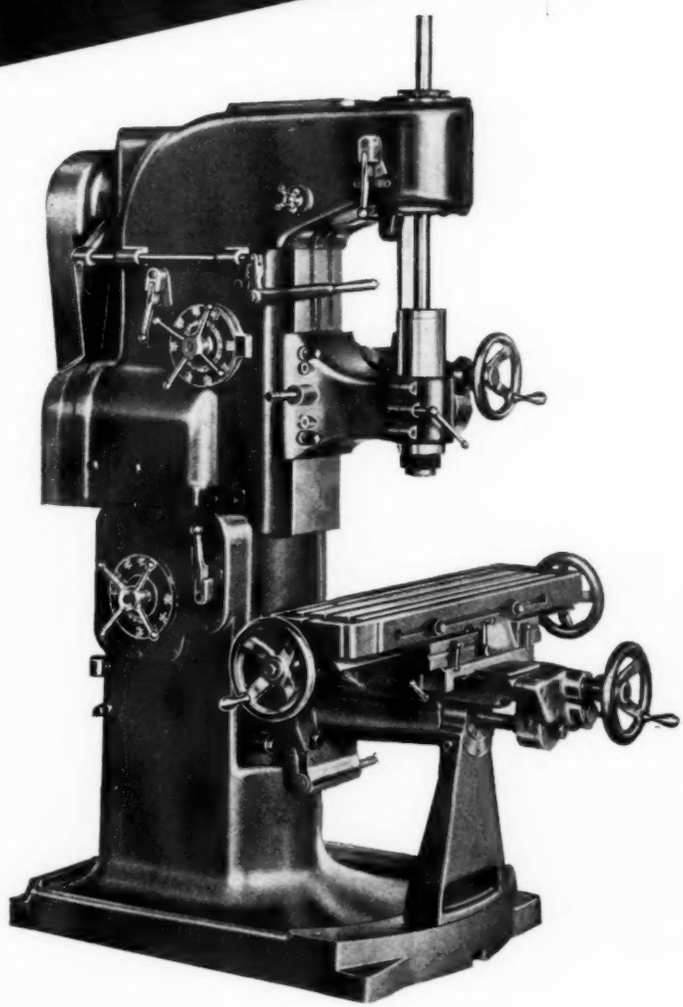
Made in four sizes, the "Yankee" machine vise offered by North Bros. Mfg. Co., Philadelphia, Pa., is available with or without a swivel base. Jaw widths are 1½, 2, 2¾ and 4-in. and jaws are faced with hardened steel plates. A separate hardened

"Speed" SAYS THE BOSS . . .

"Easy" SAYS THE SUPER . . .

"Here's a job that we've got to get out in a hurry and it must be right."

"Okay, we'll do it on our new Knight Miller."



The Super speaks from experience. He knows that when he needs that *extra* Speed plus Accuracy he gets it in the Knight Miller—ease of operation, quick and accurate locating with dial indicators and the "built-in jig" features bring results.

He knows too the *extra* profit possibilities of a machine that the operators like to handle. Quick vertical adjustments are easy with the counterbalanced Spindle Head. Ease of making tool changes and centralized simple controls make the Knight Millers a pleasure to operate.

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• ST. LOUIS, MISSOURI •

steel plates. A separate hardened steel plate having V-shaped grooves is provided for holding round stock and irregular shapes. The "Yankee" vise clamp, offered for use in connection with these vises, is designed to hold the vise for drilling and other machining operations.

Master Universal Multi-Swivel Vise

Three sizes of the "Multi-Swivel" universal vise previously described (Vol. 81, page 1239) now are available from the Master Tool Co., 137 Oliver St., Boston, Mass. Originally

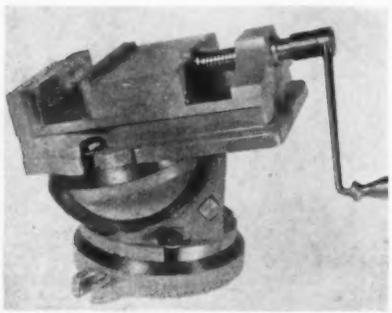


Fig. 1—Three sizes of the "Multi-Swivel" vise now are available. Base upon which the vise is mounted can be swiveled in three directions

available only in the 6-in. size, these vises are offered in 2-, 4- and 6-in. units.

Work, once set up in one of these vises, need not be disturbed, as the vise and work can be transferred as a unit from one machine to the next. As is shown in Fig. 1, these vises can be swiveled in three directions. A platen which can be mounted on the universal base in place of the standard vise, Fig. 2, also is available. This platen is provided with T-slots and varies in size from $4\frac{9}{16}$x $2\frac{3}{4}$x$1\frac{3}{8}$ for the 2-in. universal support to 16x8 and $\frac{5}{8}$x$2\frac{1}{2}$ in. for the 6-in. support.

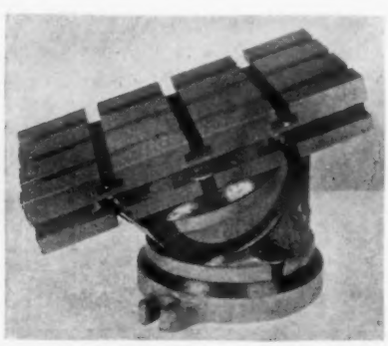
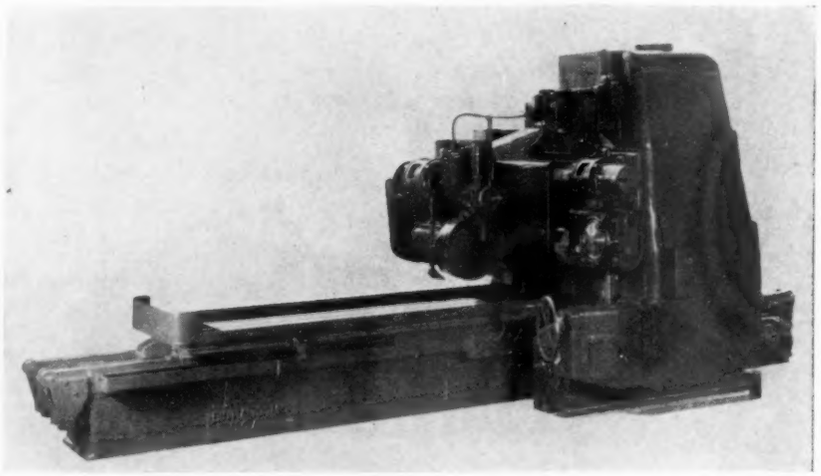


Fig. 2—T-slotted platens can be mounted on the multi-swivel bases in place of the standard machine vises

Hanchett 30 x 96-In. Planer-Type Straight Wheel Surface Grinder

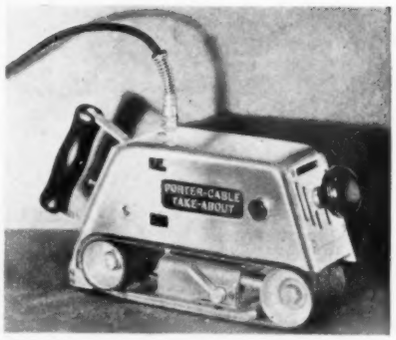


A 15-20 hp., 1,200 r.p.m. motor drives the horizontal wheel spindle of this planer-type surface grinder announced by Hanchett Mfg. Co., Big Rapids, Mich. A 20-in. diameter by 3-in. wide face grinding wheel with a 10-in. diameter center hole is used. Finished top of the work table measures 30 x 96 in. and the maximum distance under a new wheel to the table top is 20 in. Speeds up to 90 ft. per min. are available for the work table, which is provided with forced feed lubrication for the ways. Cross rail is power elevated at the rate of 5 ft. per min. Hand clamps are provided for the cross rail at the main and auxiliary housings.

Wheel head has both automatic and hand down feed. Automatic cross feed is in steps of $\frac{1}{8}$ to 5-in. A constant cross feed of 30 ft. per min. also is available. A 250-gal. welded tank is provided in the coolant system, which has a pump driven by a $\frac{1}{2}$ hp. motor. Hydraulic pump for the work table circuit is driven by a 10 hp. motor, while a 5 hp. motor provides cross feed of the grinding wheel head. Elevating motor for the cross rail assembly is of 3 hp. capacity and is equipped with an automatic brake. A $\frac{1}{4}$ hp. motor drives the forced feed lubrication pump. Machine weighs approximately 45,000 lb. and measures 11 ft. wide by 23 ft. long.

Porter-Cable T-33 "Take-About" Sander

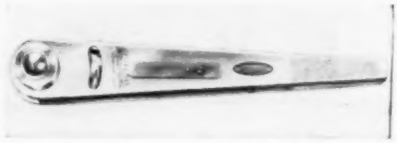
Endless cloth-backed abrasive belts of any grit, 3 in. wide and 24 in. long, are used on the Type T-33 "Take-About" sander announced by



Porter-Cable Machine Co., Syracuse, N. Y. Frame is designed with front intake slots to permit ample air circulation to carry away the heat from the $\frac{3}{4}$ hp. universal motor. Belt travels at 1,350 ft. per min. over the flat shoe. A shoe pad is available for slightly curved surfaces and a bench stand is provided to hold the sander on its side. Measuring $4\frac{3}{4}$ in. wide, $7\frac{1}{2}$ in. high and $14\frac{3}{4}$ in. long, this sander weighs 16 lb. A bench stand is available.

Bonney No. 66 Torque-Indicating Wrench

A reversible ratchet mechanism is included in the No. 66 torque-indicating wrench announced by Bonney Forge & Tool Works, Allentown, Pa. In using the wrench, the indicator is set at the desired torque by loosening an indicator clamping screw and moving the indicator to



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OSTER THREADING EQUIPMENT WILLIAMS

Designed and engineered from the base up to be the all-star performers in their field, Rapiduction Bolt Threaders of the "900" series are proving their superiority wherever installed. Built in two sizes, 3/8" to 1½" and ½" to 2¼", in double and single spindle designs, these machines not only handle all standard jobs but, because vise and carriage are free from obstructions, are particularly adapted for the application of special fixtures for holding unusual jobs.

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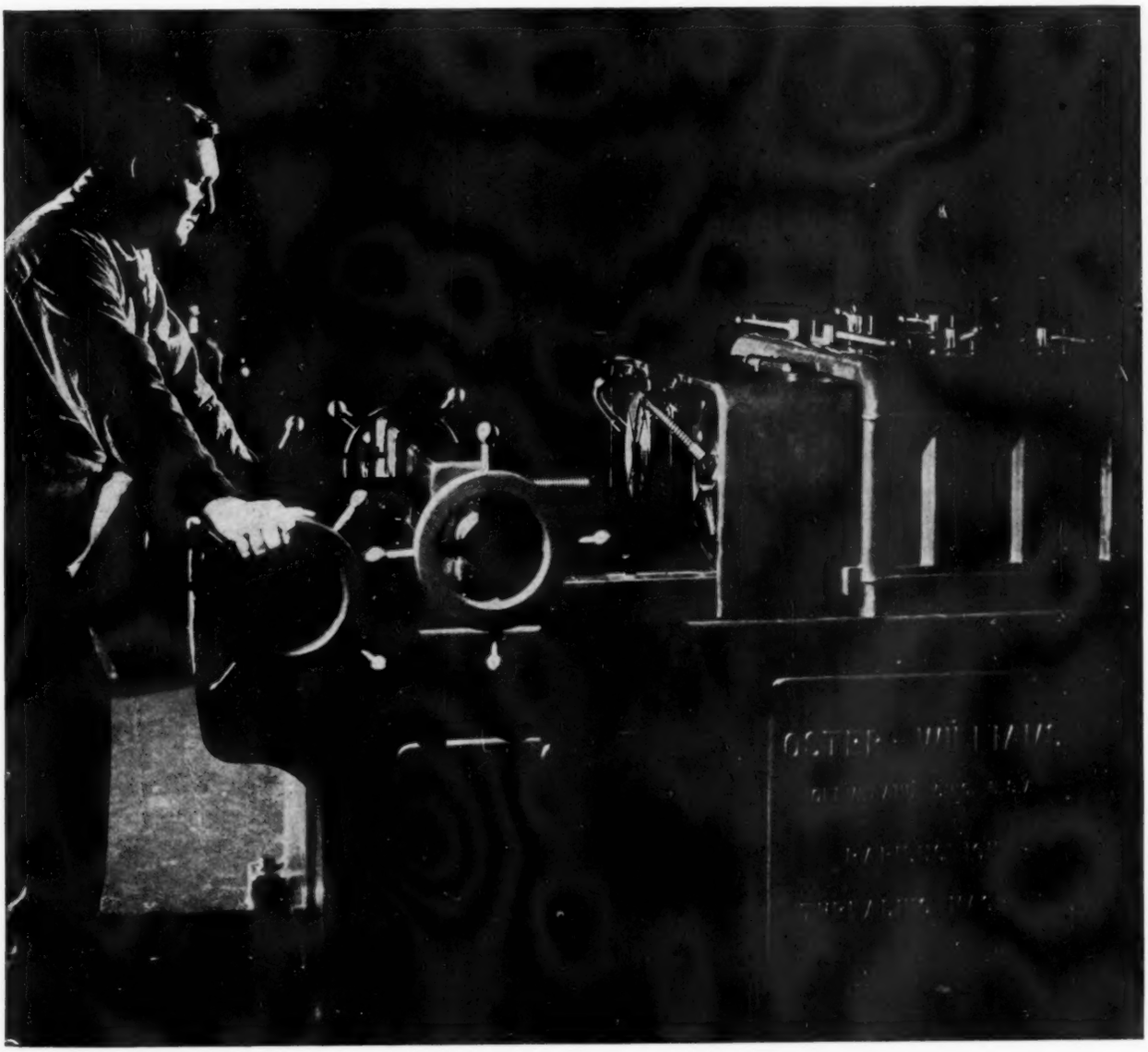
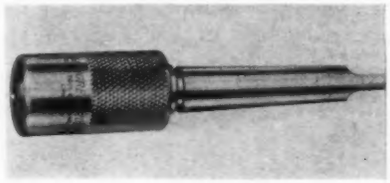
RAPIDUCTION BOLT THREADER



the desired position on the scale, then tightening the screw. Ratchet lever is moved to the extreme left of the wrench. The wrench then is operated until the ratchet lever snaps to the neutral position, where it locks.

Clark-Sundh Type RD Heavy-Duty Switches

Bulletin 101 heavy-duty master switches, offered by The Clark Controller Co., 1146 E. 152nd St., Cleveland, Ohio, are designed for use where frequent operation with minimum maintenance is required, such as for heavy-duty mill use and on crane applications. Cam controlled contactors are used with double-break silver-to-silver contacts. These switches are available from 1 to 6 points in reversing and non-reversing models.



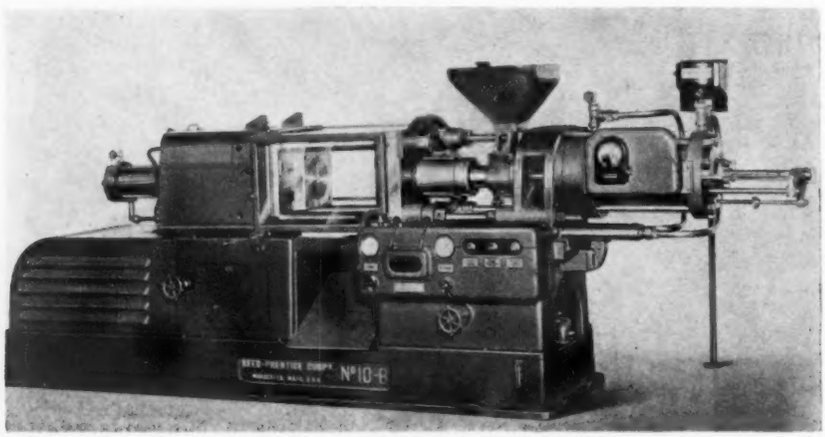
Palmgren Safety Chuck

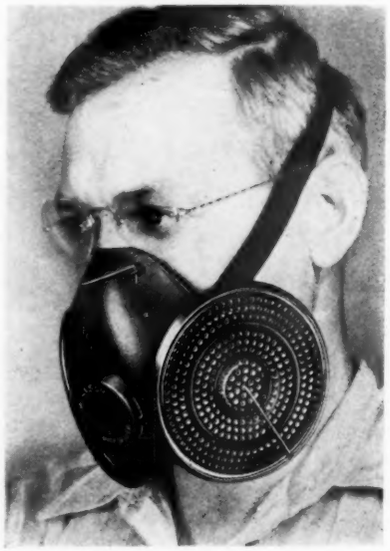
Drills of various sizes can be changed quickly, while the machine is running at full speed, with the Palmgren safety chuck developed by the Chicago Tool & Engineering Co., 8389 S. Chicago Ave., Chicago, Ill. Designed for use on drill presses, lathes, milling machines and other machine tools, these chucks release drills when the outside sleeve is held and pulled down slightly. Three sizes are available with capacity for $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{3}{8}$-in. drills.

Reed-Prentice Model 10B Improved Plastic Injection Molding Machine

Reed-Prentice Corp., Worcester, Mass., has announced improvements in the Model 10B plastic injection molding machine previously described (AM—Vol. 82, page 395). This machine features a positive toggle mechanism which locks the molds mechanically and does not depend on hydraulic pressure to hold the molds closed. Hydraulic pressure is used to open and close the molds and to operate the plunger cylinder, one pump driven by a 20-hp. motor being used to provide the 1,000 lb. per sq. in. hydraulic pressure.

Pressure on the material can be varied from 2800 to 28,000 lb. per sq. in. being regulated through the pressure valve. From 300 to 400 shots per hour can be molded, varying with the type of product. The machine has capacity for 4 oz. on 30 sq. in. at 28,000 lb., 4 oz. on 40 sq. in. at 19,000 lb. pressure or 6 oz. on 50 sq. in. at 16,000 lb. pressure. Stroke of the machine is $11\frac{3}{4}$ in. and plunger speed is 176 in. per min. Die plates measure 18 x 20 in., while space between bars is 12x12 in. Die opening is 8 in. and maximum die space is 18 in. Minimum die space is 7 in. Locking pressure of the toggle mechanism is 85 tons, and capacity of feed hopper is 35 lb. This machine weighs 12,000 lb., exclusive of motor drive and control. Floor space required is 180 x $41\frac{1}{2}$ in.





Willson No. 750 Dust Respirator

The No. 750 dual-disk respirator offered by Willson Products, Inc., 251 Thorn St., Reading, Pa., employs inexpensive throw-away filters for protection against Type A dusts. The dual-disk filters provide 28 sq. in. of filtering surface and offer little resistance to breathing.

Thor Torque-Arm Tool Balancer

Made with a 3 to 6 ft. range of travel and a load capacity of 45 to 100 lb., the Thor torque-arm tool balancer announced by Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., is adapted for suspending large electric and pneumatic drills, nut setters and other tools above the working location. These balancers not only support the tool, but also absorb the torque, completely eliminating the danger of injury to the operator when the tool "sticks." Torque-arm

telescopes to permit maximum travel when open and minimum headroom when closed. It is attached at the top to the load frame in a rocking bracket which permits the tool to be swung backward or forward, and to either side. Telescoping tube is square so that tools may be suspended either vertically or horizontally.

Resistoflex Tubing

Resistoflex Corp., 370 Lexington Ave., New York, N. Y., announce production of PVA tubing in diameters up to and including ½ in. inside diameter for oils and solvents. Larger sizes will be available in the future. This tubing is made from a flexible synthetic resin which is inert to gasoline, oils and organic solvents. It is claimed to retain its flexibility through a wide temperature range. Specific gravity of the material is 1.26. Special couplings have been developed for use with this tubing, each tube length ordinarily being supplied as a unit with its couplings.

Westinghouse Sealed Pushbutton Stations

Dust- and water-tight heavy duty pushbutton stations for service where protection from fumes, dust and moisture is desired are offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These units are suitable for operation where subjected to rough handling. Stations of one to four units are available. Cover is sealed with a cork gasket and oil treated paper. A maintained contact unit also is available.

G. E. "TuLamp" Transformer

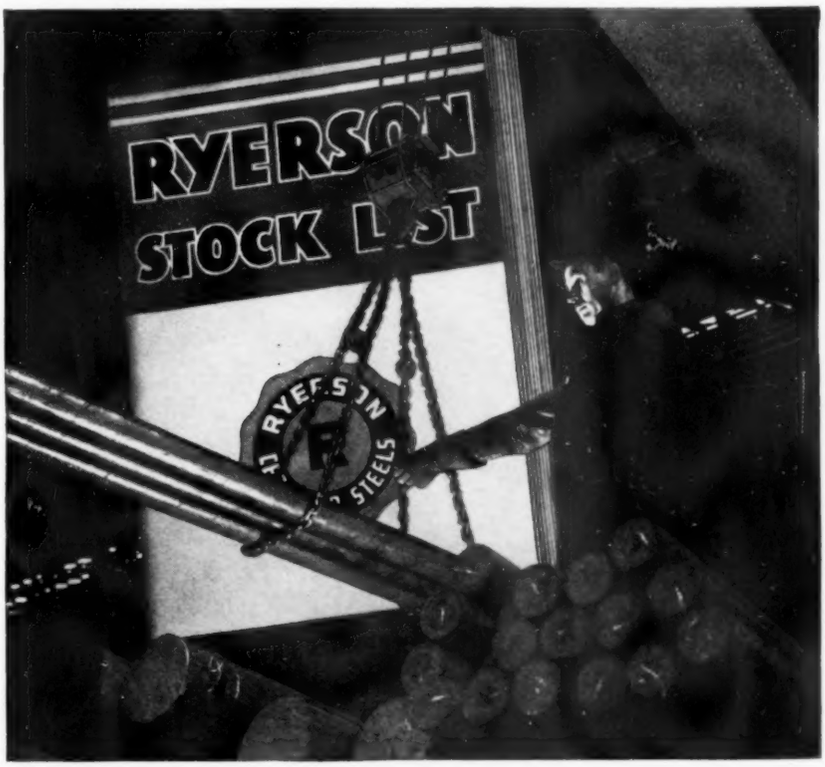
Designed to operate two 400-watt type H mercury lamps at peak efficiency and at 90-95 per cent power factor, the "TuLamp" transformer announced by General Electric Vapor Lamp Co., Hoboken, N. J., measures 1½ in. wider and is somewhat heavier than the single lamp transformer but is practically the same in general design. When using the new unit, one lamp starts and reaches its full efficiency before the other lamp. With as much as a 40-volt drop in the circuit, one lamp will continue to burn. Should one lamp burn out, the other lamp will operate normally without injury to the transformer.

Morton Salt Tablet Industrial Dispenser

A cylinder-type salt tablet dispenser fitted with a wall bracket for mounting at drinking fountains is offered by Morton Salt Co., Chicago, Ill. Tablets are kept dry and dust-free in the container until used. To secure a 10- or 15-grain salt tablet, the worker merely flips a small lever at the base of the dispenser. Refilling is accomplished by removing the friction-cover top of the dispenser and allowing the contents of a carton to discharge into the cylinder.

Smootharc "Harchrome" Welding Electrodes

Designed especially for welding 4-6 per cent chrome steel, the Smootharc "Harchrome" electrode announced by Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., is said to deposit weld metal which has



Your Guide to Certified, Uniform, High Quality Steels . . . . .

The Ryerson Stock List is your guide to large and diversified stocks of steel—the only stocks of Certified Quality Steels in the country. You have definite assurance of getting steel which has the features most desirable in the particular kind you order—whether it is a deep drawing quality sheet, high tensile structurals, easy machining screw stock or high finish stainless.

On alloy steels you get still another added feature. Ryerson sends accurate data on every bar delivered so that your heat treater can easily secure desired results—a service never befor attempted by any steel-service company.

When you want good, uniform steel, turn to the Ryerson Stock List. You will find a complete range of sizes and shapes. Immediate shipment is assured.

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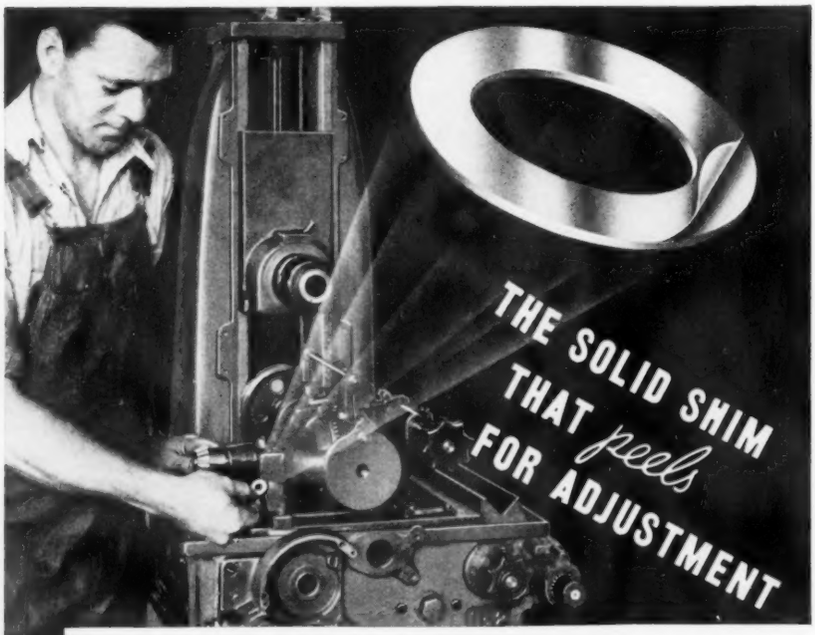
the same properties as the parent metal. Base metal used in this electrode contains from 4-6 per cent chromium and 0.50 per cent molybdenum. Available in sizes from $\frac{1}{8}$ to $\frac{3}{16}$ in. in diameter for operation with currents ranging from 80 to 200 amp. Use of the molybdenum in this electrode is said to heighten its resistance to certain types of corrosion and oxidation as well as to increase its creep strength and resistance to impact.

"Amercoat" Rapid-Dry Resistant Coating

"Amercoat" rapid-dry, corrosion-resistant coatings announced by American Concrete and Steel Pipe Co., P. O. Box 1428, Arcade Station, Los Angeles, Calif., may be applied with a paint brush or paint spray equipment to form a protective covering for exterior or interior surfaces that are subjected to the corrosive action of liquids, gases or solids. This solution is said to resist the action of acid and alkali and other types of corrosive agents up to and including 20 per cent concentration. It is insoluble in salt water or in petroleum derivatives.



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Bethlehem Seamless Tubular Products

A line of seamless steel tubular products has been announced by Bethlehem Steel Co., Bethlehem, Pa. All standard sizes and types of seamless casing, tubing and line pipe up to and including $8\frac{5}{8}$ in. outside diameter are available.

Cramer Time Meter

A summating running-time meter which registers automatically the operating time of a circuit, apparatus or system has been announced by R. W. Cramer & Co., Inc., 67-69 Irving Place, New York, N. Y. This meter is driven by a slow-speed, self-starting synchronous motor. It is made in two types, one for registering total hours and the other for registering total minutes. A five-dial counter is used, indicating in tenths up to 9999.9 and repeating. Meter is connected in parallel with the machine or apparatus of which the total operating count is to be registered and the synchronous motor starts and runs continuously while the machine is operating. Housing is made of molded Bakelite.

Richloy "Hi-Tensile" High-Strength Solders

Improved Richloy "Hi-Tensile" solders offered by National Cable & Metal Co., 1727 Standard Ave., Glendale, Calif., are said to have a low melting point, as well as greatly increased tensile strength. These solders are available in bars, big or plain wire form.

Inland Open-Hearth Free Cutting Steel

Said to have properties including 20 to 50 per cent better machinability, a new open-hearth steel being introduced by Inland Steel Co., First National Bank Bldg., Chicago, Ill., is the result of cooperative research on the part of the Battelle Memorial Institute and Inland's research division. This steel is said to have been

tested in all types of machining and is claimed to show marked superiority in machinability not only to open hearth steel, but to Bessemer screw stock. Tests on this steel in the higher carbon analyses indicate the possibility of making steels that are truly free machining in these carbon ranges.

"Silverstat" Automatic Voltage Regulator

Available in a range of sizes for the automatic voltage control of small a.c. and d.c. generators, the Silverstat regulators announced by Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., have no vibrating contacts and no parts which require adjustment or replacement at frequent intervals. These regulators have been designed to be placed in operation easily and to require practically no maintenance. Only simple rheostat adjustments are made when putting the unit into service, internal adjustments being made at the factory. Regulator is of the direct-acting, rheostatic type and regulates the voltage by varying directly the resistance in the field circuit. Regulating action is that of a semi-static device which operates only when a correction in voltage is necessary.

"Amer-Tran" Type UL Lighting Transformer

Designed to permit individual lighting of electrically operated machines from high-voltage power circuits, the type UL "Amer-Tran" transformer announced by American Transformer Co., 178 Emmet St., Newark, N. J., is designed to be mounted as an integral part of the machine. Units are available for use where the power-circuit voltage is 115, 230, 460 or 575 volts and to supply any standard lamp voltage from 6 to 115 volts. Standard sizes are rated 75, 150, 225 and 300 watts output.

Curtis Recessed Lighting Equipment

Standard recessed equipment for general lighting with reflectors mounted above the ceiling is offered by Curtis Lighting, Inc., 1123 W. Jackson Blvd., Chicago, Ill. A complete line of housed and unhoused units is available, all of which can be equipped with distributing, semi-concentrating and concentrating reflectors.

TALKING SHOP

Little Acorns

Oftentimes it is difficult to get new machinery into a plant because old methods and old machinery are still considered to be doing their job satisfactorily and catalogs and conversation cannot accurately determine the possible advantages of new machinery. A plant which has been going along for years with a minimum amount of improvement was suddenly confronted with the necessity for a new milling machine. After this machine had been installed, its modern performance so out-ranked any of the other machines in the place and its ease of operation and versatility were so outstanding that every man in the shop asked to be assigned to the new machine. Foreman and supervisors became so enthused with the possibilities of this one new machine that within the

GORTONS and
HOOVER
CLEANING ENSEMBLES
The bag ring necessarily gets a lot of handling from users of Hoover Cleaning Ensembles. Each time the bag is emptied the ring has to be removed and then replaced dust-tight. The Hoover Company makes the bag ring of a plastic material, the molds for which are produced on the Gorton Duplicator at large savings over former methods.
The 9 cavity mold originally used required 56 hours of tool labor per cavity, a total of 504 hours. With a Gorton Duplicator, after the first cavity was tooled out, it was used as a master for reproducing the other 8 cavities in 8 hours each. The tool labor for the mold was thus reduced to 120 hours, a saving of 384 hours or 76%.
Ask us to show you what we have done in reducing die and mold production costs.
GEORGE GORTON MACHINE CO.
1103 13TH ST., RACINE, WIS.

course of one year more and more new machines have been sold in this plant. Not only has it been possible to sell machines for general work on the basis of this one machine's performance but the plant has now become alive to the possibility of special machinery. The enthusiasm with which all workers accepted new equipment and asked to be assigned to it plus the speed and quality with which work was produced has made this plant definitely modernization conscious. Actual demonstration on one machine had to do the job which all the talking in the world could never have done.

Pay Yourself a Dividend

The problem of keeping production moving and men satisfied at the same time has caused a lot of head scratching and more methods of payment than you can shake a stick at. We were in a plant recently which is on production but pays a standard weekly wage. It keeps up a good steady flow of work because every employee owns a part of the business. Every Xmas the men who have been with the company over six months receive a bonus paid in company stock. As the company is live and prosperous it has been paying dividends right along. The result of every man's efforts is indicated in the amount of the dividend. Not only does the work move right along but every man puts in the extra licks and watches the little things which the owner of every business does.

Mistake Proof

Knowledge of human nature, which some call psychology, is a great help in any shop. "We all do foolish things," said the old superintendent, "but none of us enjoys being called a fool. So when my young tool designer suggested dropping the term fool proof in referring to jigs and fixtures, I was mighty glad to agree."

Face-saving is supposed to be an Oriental trait, but none of us like to have our mistakes or weaknesses paraded before the world. "Mistake proof" is a lot more agreeable designation than fool proof, and saves a lot of hard feelings, whether we call it saving face or by any other name.

Suggest Now

Getting ideas for improvement or changes is difficult in most companies and requires a lot of ballyhoo. One that we know of has no central box for collecting these ideas. Instead, each machine and bench is supplied with a pad of standard suggestion blanks, the idea being to get the employee to jot down his suggestions while actually working on a job. The suggestion is then handed in with the blueprint and the finished work. If the suggestion is approved credit is given on the employee's record and a cash return paid depending on the savings made.

8 *out of* 14

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The right steels, scientific heat treatment, correct design and precision grinding . . . these are the important factors in producing reamers that will stand up under rugged service and satisfactorily meet production requirements.

In this connection it is significant that EIGHT of fourteen leading makers of machine tool reamers use Oakite materials either for making up grinding compounds where close tolerance and finish are essential in producing high grade work; or, for cleaning and rust proofing work between operations.

Dependability of results at low-cost, thorough and consistent performance day in and day out are the reasons that prompt so many leading manufacturers today to specify and use Oakite materials and methods.

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Whether for cleaning, for rust proofing, for making up your own grinding or cutting compounds, you will find that among the more than 53 different Oakite materials produced, there is one that will meet your requirements for fast, effective results at low-cost plus safety to product, equipment and workmen. Let us give you specific recommendations on your work. Won't you write today?

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TRADE PUBLICATIONS

BENCH LATHES Two small screw-cutting bench lathes, swinging diameters to 6 in. are described in Catalog No. 29 offered by Atlas Press Co., Kalamazoo, Mich.

CADMIUM PLATING Use of "Cadalyte 38" for cadmium plating is discussed in a 12-page bulletin pub-

lished by Electroplating Div., E. I. duPont de Nemours & Co., Inc., Wilmington, Del. Full operating instructions are given.

CHAIN Bulletin No. 305 offered by Chain Belt Co., Milwaukee, Wis., is a data book giving information on Rex oil well chain for various drive applications.

CHEMICAL EQUIPMENT Corrosion-resistant chemical equipment is discussed in Bulletin No. O–1 offered by Haveg Corp., Newark, Del.

CONTROL General Electric Co., Schenectady, N. Y., has announced publication of bulletins discussing the features of various electrical control apparatus. Bulletin No. GEA-2889 discusses the features of CR7006 magnetic motor-starting switches for full-voltage starting of a.c. motors. An improved track-type limit switch, No. CR9440-A1A, is described in Bulletin No. GEA-2052A. Bulletin No. GEA-67E describes Type CR2931 float switches for use with automatic pumping equipment.

CORROSION A bulletin summarizing the use of chromium chemicals for the purpose of inhibiting corrosion is offered by Mutual Chemical Co. of America, 270 Madison Ave., New York, N. Y.

FOUNDRY EQUIPMENT Materials handling equipment developed specially for foundry use is described in Bulletin No. 318 offered by Chain Belt Co., Milwaukee, Wis.

GEARS Information on various types of speed reducing and speed increasing gear units and related products is contained in an 80-page illustrated catalog recently published by Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y. Also included is a chapter on gear design and a description of the Farrel-Sykes gear generating machines. Ask for Catalog No. 438.

GRINDER Catalog No. N-138 announced by Landis Tool Co., Waynesboro, Pa., discusses features of the Landis 10-in. Type D hydraulic crank pin grinder. Illustrations show principal features of this machine and typical grinding set-ups.

GRINDERS Bench and pedestal type ball-bearing grinders are described in a ten-page bulletin recently published by Queen City Machine Tool Co., 217 E. Second St., Cincinnati, Ohio.

HARDNESS TESTING Bulletin No. 1, announced by Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa., discusses the features of a number of hardness testing machines. An automatic direct-reading Brinell tester is described.

LATHE Catalog No. 103, offered by the Crankshaft Machine Co., Jackson, Mich., discusses the features of the Type CFB Melling crankshaft lathe for turning pin bearings and facing the cheeks.

LABOR Pamphlet No. 21, published by Public Affairs Committee, Inc., 8 W. 40th St., New York, N. Y., is entitled "Labor on New Fronts" and discusses the record of the National Labor Relations Board as well as a survey of the growth of the C.I.O. Price, 10 cents per copy.

MOTORS Three bulletins discussing the features of various electric motors have been announced by General Electric Co., Schenectady, N. Y. Type B, d.c. motors of constant and adjustable speed types are described in Bulletin No. GEA-1542C. Bulletin No. GEA-2714 dis-

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It must be remembered Oilgear is the one proven means of applying power smoothly, flexibly, controllably, efficiently. And that successful broaching must have just those features for which Oilgear alone is famous. Oilgear Surface Broaching Machines thus quite naturally provide a smoothness of operation, an incomparable dependability of performance, and such low maintenance costs that experienced shops will consider no other makes. Oilgear Surface Broaching Machines are pushing production at close tolerances past any records known before. If you want to check what this means in terms of your product, send for full information including Bulletin 23,000A. THE OILGEAR COMPANY, 1301 W. Bruce St., Milwaukee, Wis.
• One or more pieces finish-broached simultaneously
• Highest production at close tolerances
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• 6, 10, 16, 20 ton capacities
OILGEAR SURFACE BROACHING MACHINES

cusses the features of Type MR wound-rotor a.c. crane motors, and Bulletin No. GEA-1437-C gives information on various types of gear-motors ranging in capacity from $\frac{1}{8}$ to 75 hp.

SCREW DRIVERS "Facts about Stanley Electric Screw Drivers" is the title of an 8-page bulletin discussing electric screw drivers and accessories offered by Stanley Electric Tool Div., The Stanley Works, New Britain, Conn.

STEEL Rycrome and Nikrome "M" steels for a wide variety of heavy-duty applications are discussed in a four-page bulletin offered by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill. Comprehensive data on physical properties of these steels are given.

TUBE TOOLS A complete line of copper tubing service tools are described in a folder, Form No. 299, offered by the Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago.

A new small, sensitive radial is added to the Cincinnati Bickford line—designed for production drilling in parts ordinarily handled on large upright drills or belt-driven radials.

With its 1 HP motor this new Super Service Radial will pull a 1" drill in cast iron or ¾" drill in steel.

Cincinnati Bickford quality construction throughout—with automatic oiling, anti-friction bearings, multiple-splined integral key shafts, head mounted on ball bearing rollers and hardened steel armway, insures long life and fast operation.

Direct reading lever controls three spindle speeds in any one of several ranges. Six spindle speeds may be had by using a 2-speed A.C. motor. To change from one speed range to another, pick-off gears are available. Thus adaptability is secured without sacrificing simplicity and economy.

Detailed information available on request.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

NEW BOOKS

METAL AIRPLANE STRUCTURES. *By Major Flavius E. Loudy, Air Corps Reserve. Five hundred 6x9 in. pages, 284 illustrations, 68 tables. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York, N. Y. Price,* $5.00.

Major Loudy has been aeronautical engineer with the U.S. Army and Navy, Glenn L. Martin and the Goodyear-Zeppelin Corporation, and has spent a good many years on design of metal airplanes. He discusses types of metal airplanes in use, both American and Foreign, materials of construction, structural elements, welded joints, reveted joints, stressed skin design, types of metal wings, metal wing beams, wing design, fuselage design, and hull design.

PRINCIPLES OF ENGINEERING ECONOMY, *second edition. By Eugene L. Grant, associate professor of economics of engineering, Stanford University. 431 pages, 5⅜x8 in. Indexed and illustrated. Clothboard binding. Published by the Ronald Press Company, 50 E. 26th St., New York, N. Y. Price,* $3.75.

If engineering is one of the most exact professions, economics is probably one of the vaguest. But Professor Grant in his revised volume does not attempt to treat economics in this wide, whither-go-we? sense. Rather he gets it down to practical problems of business investment, applying especially to industry.

His book forms the connecting link between the engineer and the entrepreneur, and applies the exact thinking of the engineering profession to the often confused principles that surround investment. His revision is based on experience in teaching this subject at Stanford University. In it he has strengthened his book and emphasized important points that previously proved pitfalls for many of his students.

TRANE AIR CONDITIONING MANUAL. *By William Goodman, Trane engineering staff. 325 pages, 8½x11 in. Indexed and illustrated. Clothboard binding. Published by The Trane Company, La Crosse, Wis. Price,* $5.00.

Written and compiled with the cooperation of the Trane engineering and laboratory staffs, this manual includes the results of a large amount of original research work on the subject of air conditioning. Included

with the book is a psychrometric chart and special ruler to facilitate the solution of a number of intricate air conditioning problems.

Illustrative examples are given for almost every type of problem which might be required in air conditioning work, the methods employed being developed from a consideration of the physical ideas behind them. Extensive tables are given both to present data in a simple fashion and to avoid the time-consuming use of mathematical formulas.

The manual contains an analysis of the properties of air and a discussion of the computation of steam quantities for steam jet refrigeration. Original information on the use of water in relation to air conditioning also is included.

Data for computing ordinary and solar heat gains is given in such a way that the computation of total heat gain is reduced to an orderly routine. The entire refrigeration cycle and computations involved are presented in simple fashion, all computations likely to be encountered in air conditioning work are illustrated by practical examples.

PATENTS

May 10, 1938

Metal-Working Machinery

Metalworking Machine (Multiple Spindle). Alfred E. Drissner, Cleveland, Ohio, assigned to The National Acme Co., Cleveland, Ohio. Patent 2,116,565.

Cutting or Milling Machine. George A. Bouvier and Harold R. Laird, Chicago, Ill., assigned to Western Electric Co., Inc., New York, N. Y. Patent 2,116,593.

Metal Threading Apparatus. Edward J. Protin, Charleroi, Pa., assigned to Pittsburgh Steel Co., Pittsburgh, Pa. Patent 2,116,639.

Forging Apparatus. Charles W. Dawson, Oakmont, Pa., assigned to Woodings-Verona Tool Works, Verona, Pa. Patent 2,116,670.

Grinding Machine. Edwin H. Odom, Port Washington, Wis., assigned to Simplicity Mfg. Co., Port Washington, Wis. Patent 2,116,686.

Welding Apparatus. Harry E. Rockefeller, New York, N. Y., and John M. Halbing, Bloomfield, N. J., assigned to Union Carbide & Carbon Corp., New York, N. Y. Patent 2,116,870.

Machine for Grinding Cylindrical and External Surfaces. Albert Bleasdale, Detroit, Mich., assigned to Micromatic Hone Corp., Detroit, Mich. Patent 2,116,922.

Parts and Mechanisms

Grinding Machine (Spindle). Ernest A. Hall, Toledo, Ohio, assigned to The Hall Mfg. Co., Toledo, Ohio. Patent 2,116,498.

Adjusting Mechanism for Transmissions. Walter A. Garratt, Covington, Ky. Patent 2,116,624.

Gear Shifting Mechanism. Walter E. Bassett, Grand Rapids, Mich. Patent 2,116,692.

Diminishing Feed (for Grinder). Elphege D. LaFleur, Lancaster, Mass. Patent 2,116,794.

Flexible Joint for Machine Parts. Adolphe Kégresse, Paris, France. Patent 2,116,835.

Spray and Jet Nozzle. Clarence F. Dinley, Detroit, Mich., assigned to Solvent Machine Co., Detroit, Mich. Patent 2,116,863.

Adjusting Means for Honing Tools. Kirke W. Conner and Albert Bleasdale, Detroit, Mich., assigned to Micromatic Home Corp., Detroit, Mich. Patent 2,116,925.

Processes

Making Slide Fasteners. Gideon Sundback, Meadville, Pa., assigned to Talon, Inc., Meadville, Pa. Patent 2,116,547.

Method of Making Fastener Units. George E. Prentice, Berlin, Conn. Patent 2,116,712.

Method of Making Fastener Units. Robert C. Legat, New Britain, Conn., assigned to G. E. Prentice Mfg. Co., New Britain, Conn. Patent 2,116,726.

Mechanically Working Metal Article. Fritz Singer, Nuremberg, Germany, assigned to Tubus A. G., Zurich, Switzerland. Patent 2,116,954.

Method of and Apparatus for Manufacturing Links for V-Belting from Sheet Material. Percival Thomas Evans, Coventry, England. Patent 2,117,057.

Tools and Accessories

Soldering Iron. Victor I. Cruser, East Orange, N. J., assigned to Bell Telephone Laboratories, Inc., New York, N. Y. Patent 2,116,562.

Screw Driver. George F. Blackburn, South Portland, Me. Patent 2,116,775.

Forging Apparatus (Die). Clarence S. Swanson, Chicago, Ill., assigned to

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Standard Forgings Corp., Chicago, Ill. Patent 2,116,804.

Apparatus for Forging and Forming Steel Disk Wheels and the Like (Die). Clarence S. Swanson, Chicago, Ill., assigned to Standard Forgings Corp., Chicago, Ill. Patent 2,116,805.

Drafting Device. Walter J. Greenleaf and Lewis Skeel, Meadville, Pa. Patent 2,116,887.

Expansible Cutter Tool. Glenn D. Johnson, Compton, Calif., assigned to MacClatchie Mfg. Co., Compton, Calif. Patent 2,116,898.

Expansible Cutter Tool. John W. MacClatchie, Los Angeles, Glenn D. Johnson, Compton, and Carl A. Thies, Huntington Park, Calif., assigned to MacClatchie Mfg. Co., Compton, Calif. Patent 2,116,903.

Gauging Machine. Raymond H. Cramer, Newark, N. J., assigned to General Motors Corp., Detroit, Mich. Patent 2,116,926.

May 17, 1938

Metal-Working Machinery

Power Hammer for Stamping With Counter-Tup. Leon Saives, Billancourt, France, assigned to Louis Renault, Billancourt, France. Patent 2,117,575.

Circular Relief Grinder. Clyde E. Walling, Lakewood, Ohio. Patent 2,117,637.

Automatic Cam Grinding Machine. Herbert A. Silven and Carl G. Flygare, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,117,916.

Automatic Grinding Machine. Herbert A. Silven, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,117,917.

Grinding Machine. William Ogilvie, Knowle, England, assigned to B. S. A. Tools, Ltd., Birmingham, England. Patent 2,117,979.

Machine Tool (Vertical Lathe). Myron Shirley Curtis, Pawtucket, R. I., assigned to William Wallace Potter, Pawtucket, R. I. Patent 2,118,020, 2,118,022 and 2,118,023.

Improvements in Machine Tool (Vertical Lathe). Myron S. Curtis, Pawtucket, R. I., assigned to William Wallace Potter, Pawtucket, R. I. Patent 2,118,021.

Machine Tool (Automatic Lathe). William Wallace Potter and Myron S. Curtis, Pawtucket, R. I., assigned to William Wallace Potter, Pawtucket, R. I. Patent 2,118,024.

Machine Tool, Particularly of the Hydraulic Operated Type. Myron S. Curtis, Pawtucket, R. I., assigned to William Wallace Potter, Pawtucket, R. I. Patent 2,118,025.

Parts and Mechanisms

Constant Leakage System for Hydraulic Apparatus. Richard W. Dinzl, Narberth, Pa., assigned to Baldwin-Southwark Corp., Delaware. Patent 2,117,303.

Stepless Change Gear. Albrecht Maurer, Bad Homburg v.d. Hohe, Germany, assigned to Firm P. I. V. Ketten und Getriebe G.m.b.H., Bad Homburg v.d. Hohe, Germany. Patent 2,117,340.

Variable Speed Device. Darcy E. Lewellen and Emmons F. Lewellen, Columbus, Ind. Patents 2,117,483 and 2,117,485.

Speed Synchronizing Device. Darcy E. Lewellen and Emmons F. Lewellen, Columbus, Ind. Patent 2,117,484.

Variable Speed Transmission. Darcy E. Lewellen and Emmons F. Lewellen, Columbus, Ind. Patent 2,117,486.

Self-Lubricating Bearing. Howard B. Eynon and Myrtice C. Burr, St. Marys, Pa., assigned to Pure Carbon Co., Inc., St. Marys, Pa. Patent 2,117,550.

Control for Fluid Motors. Gerhard H. J. Baule, Syracuse, N. Y. Patent 2,117,595.

Roller Thrust Bearing. Charles Henry Smith, Essex, England, assigned to Norma-Hoffmann Bearings Corp., Stamford, Conn. Patent 2,117,633.

Hydraulic Transmission. Alf Lysholm, Stockholm, Sweden, assigned to Aktiebolaget Ljungströms Angturbin, Stockholm, Sweden. Patent 2,117,673.

Bolt. Robert E. Harmon, Chicago, Ill. Patent 2,117,717.

Roller Bearing. Jacob Fisher, Philadelphia, Pa. Patent 2,117,877.

Outboard Swivel Support (for Gear Hobber). William F. Zimmermann, Maplewood, N. J., assigned to Gould & Eberhardt, Newark, N. J. Patent 2,117,930.

Processes

Method of Manufacturing Valves. Sven J. Nordstrom, Piedmont, Calif., assigned to Merco Nordstrom Valve Co., Pittsburgh, Pa. Patent 2,117,351.

Tools and Accessories

Gauge. Warren Ames, Newton, Mass. Patents 2,117,267 and 2,117,268.

Boring Machine (Grooving Tool). Ivan H. Ihm and Charles F. Tuttle, Richmond, Calif., assigned to Standard Oil Co. of California, San Francisco, Calif. Patent 2,117,327.

Aligning Device. Lawrence H. Strayer, Kent, Ohio, assigned to The Lamson & Sessions Co., Cleveland, Ohio. Patent 2,117,376.

Pinhole Gauge. Joseph Sunnen, Kirkwood, Mo. Patent 2,117526.

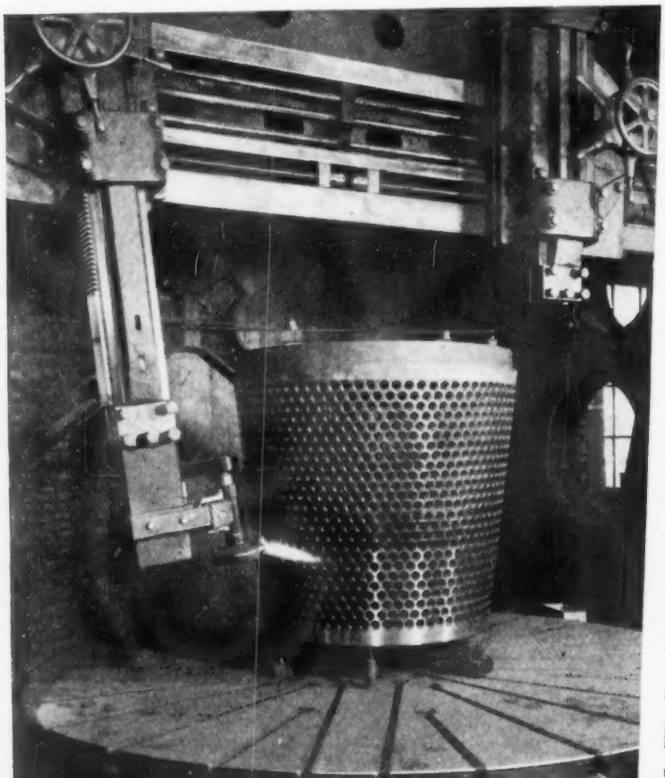
Tube Flaring Tool. Roy J. Corrigan, Detroit, Mich., assigned to Bundy Tubing Co., Detroit, Mich. Patent 2,117,543.

Reversible Motor (Portable Tool). Paul Van Sittert, South Euclid, Ohio, assigned to The Cleveland Pneumatic Tool Co., Cleveland, Ohio. Patent 2,117,584.

Circular Saw. Charles M. Willson, Bridgeport, Conn., assigned to Raybestos-Manhattan, Inc., Passaic, N. J. Patent 2,117,586.

Cutting Torch. George L. Walker, Jersey City, N. J., assigned to Air Reduction Co., Inc., New York, N. Y. Patent 2,117,751.

Differential Pinion Gauge. Arthur E. Price, Jackson, Mich., assigned to Hinckley-Myers Co., Jackson, Mich. Patent 2,117,854.



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